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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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The Conference on Colloids

THE joint conference of the Faraday Society and the Physical Society of London on "Colloids," held during the afternoon and evening of Monday last at the Institution of Mechanical Engineers was a great success, if success be measured by the quality of the papers and the number of those who attended. On the other hand, the operation of attempting to put several gallons, not merely a quart, into a pint pot is generally considered impossible and if attempted leads to disaster. To endeavour to deal with twelve papers in five hours is a manifest absurdity, and this becomes still more pronounced when groups of papers have to be preceded by more or less long addresses from the openers of debates dealing with specific groups of subjects. The bulk of the audience did not possess proofs of the papers. Some were read in such an abstracted form that it was clearly impossible to use the abstract as a basis for debate. This was neither fair to the reader of the paper nor to the audience, and the situation was rendered worse by the fact that with the very pronounced exception of two or three speakers the remarks of the readers or abstractors were inaudible to the majority of those present.

These joint debates are undoubtedly of very great value for they bring together a large number of people who have knowledge of and are interested in the subjects to be presented, but it would be fairer to authors of papers and to the audience if it were made clear that a large number of papers would be published, but only a limited number read and opened for discussion.

It was quite obvious that many more of the audience would have been willing to join in the discussion had it not been apparent that by doing so they would have rendered the completion of the programme an impossibility. From experience of other scientific congresses we know that it is impossible to read and adequately discuss more than two papers in a period of two-and-a-half to three hours. Had the discussion been confined to the papers dealing with nitro-cellulose subjects a very useful afternoon and evening might have been spent. As it was, it is to be feared that many went away feeling that so much had been attempted that nothing was adequately done. It is generally accepted that the discussion arising out of a paper is often more valuable than the contribution itself. It is no use taking up the attitude that contributions to the discussion can be sent in writing for the simple reason that many in the audience may have knowledge of isolated facts of the deepest interest which they are willing to mention during a discussion, but which they are not likely to put in writing, and there were several instances during the discussion where such isolated facts were brought forward.

Those among the large audience who came out of general interest would no doubt be astonished to learn what a vast and direct bearing scientific work has on problems touching daily life, and indeed it must have been a revelation to many how closely colloid chemistry bears upon innumerable aspects of everyday matters. One thing must have impressed itself upon everyone, namely, the extent to which industrial practice is in advance of scientific knowledge in relation to colloidal matters.

Some Notes on the Papers

PROFESSOR SVEDBERG'S opening address was an admirably concise exposition of the present situation of our knowledge of the subject of colloids. Owing to its brevity it had of necessity to be very general, but only a master of the subject could have brought the leading facts together in such an excellent manner. Mr. Bhatnagar outlined a very simple method for distinguishing an important point which frequently arises during the production of emulsions, namely, that at which a reversal of type occurs, that is, when a water-in-oil emulsion converts itself into an oil-in-water emulsion. This theoretical paper bore close relation to Mr. Clayton's practical paper on emulsion

problems in margarine manufacture, for the problem of reversal is of the greatest importance in this industry. Probably many of the hearers would be astonished to learn how many and how complex are the problems associated with the manufacture of margarine and would be impressed more by the amount that the theorists do not know than by what they do know.

The second portion of the discussion, after the tea interval, dealt with Mr. Bredford's paper on the reversible sol-gel transformations and Dr. Barratt's on the structure of gels. The illustrations of the fibrous structure of certain gels were of great interest, but it must be borne in mind that the camera and the microscope can be—as one observer puts it—the most artistic liars in the scientific world, and that without the slightest intention on the part of the operator. The opening discussions to this section by Dr. Hatschek and Professor Proctor, representing two schools of thought, was very interesting and the point raised by Dr. Hatschek as to the necessity for greater correlation between the purely physical-chemical and the mechanical investigations of gel structures should receive consideration. Sir Herbert Jackson gave, in an easily audible and popular manner, the most interesting presentation of a number of little-known but exceedingly interesting facts regarding the behaviour of glasses and particularly of the colouring matters employed in glass making.

After dinner, Sir Robert Robertson, Mr. Sproxton and Mr. Bircumshaw dealt with the colloidal problems attached to the treatment of nitro-cellulose and cellulose compounds in various solvents. This group of papers would have formed ample material and would probably have led to ample discussion to have satisfied the whole time occupied by the Congress. The matters dealt with were not merely of theoretical importance, but of the greatest practical interest. Mr. Porritt, in a short but interesting paper, brought forward a number of facts on the behaviour of rubber solutions under the influence of light which will probably give rise to much experimental work and open up new fields of research. Mr. Mukherjee's paper was read in such abstract that those who had not studied the paper before the meeting could not be expected to discuss it even had the hour not been already too late. This is a pity because, as one of the speakers stated, the subject treated was of fundamental importance, and the paper much too full of incentive to discussion to have been brought forward at the tail of the congress. Dr. Ormandy's paper was a very brief précis of the industrial applications and one, which, had it been read under other conditions, would have led to valuable discussion and probably to the discovery that there were many other applications of cataphoresis and electro-endosmose in industrial life about which little is known.

Verboten !

From accounts that reach us from various quarters we are afraid that the Council of the Society of Chemical Industry are persisting in their foolish policy of trying to bury the Society's head in the sand. The various sections have apparently been warned from headquarters, like so many naughty children, that practically no reports worth publishing must be permitted of papers and addresses at the sectional meetings. The reason, of course, is quite well-known, though out of politeness nobody mentions it. It is simply a form of the most artificial protection, deserving to rank with the classic case of the tallow chandlers who objected to free trade in sunshine as endangering their livelihood. From evidence before us we believe the sections themselves resent this grandmotherly government from Central House. Equally the contributors of papers dislike it. At present one of the small but appreciated rewards of their work is the notice they receive in the trade and technical journals, which travel far outside the limits of the Society's membership, and serve research and scientific education by stimulating a wider interest in the subjects discussed. For the future they must be content with a solemnly prepared official abstract, to be published perhaps three months hence or not at all, in the official organ, and carefully withheld from all outside the Society's membership. At a time when Professor Armstrong is lamenting the lack of interest in scientific discourses, when Lord Moulton is pleading with the chemists to take their proper place not merely in the laboratories but in the public life of the country, when the leaders of industry require to be educated in the need of utilizing science more and more, could anything be more futile and short-sighted than this policy of trying to run the Society's business with all the shutters up ?

A pleasant contrast with this attitude is supplied by the Faraday and Physical Societies in the spirit in which they organised the joint conference on "Colloids" this week. The meetings, designed to diffuse knowledge and not to bury it, were open to all. Instead of doling out the information, as a chemist might measure out drops of precious essence, advance copies of all the papers were supplied to the Press, and every effort made to spread any new light on the subject as widely as possible. Mr. Spiers is to be congratulated on the excellence of his arrangements for securing publicity, and it was a most happy circumstance that the announcement of the conferment on him of the O.B.E. should be made at the opening of the conference. It is public-spirited work of this sort which wins respect and material support for learned and scientific societies, and the Society of Chemical Industry is not likely to strengthen its position before the public by trying to shut down truth in its own little private well.

The Dangers of Oil Fuel

Only recently we drew attention in these columns to the dangers associated with oil fuel, and it was urged that the Factories Department of the Home Office should take the matter in hand so as to ensure adequate precautions being observed. The Committee appointed by the Board of Trade in January (with Sir Thomas Bell as chairman) to enquire into the means for preventing fire has now issued its report (Cmd. 944). The report does not provide much information as to the prevention of explosions such as have recently occurred, but it contains a great deal of valuable information which should be responsible for a diminution in fire risks. The main cause of trouble would appear to be the leakage of hot oil from joints in the pressure system leading to

the burners. It is proposed that the oil pressure pipes should be of solid drawn steel, and that they should be placed where they are plainly visible, if possible at a height where they may be readily inspected and not laid on the ship's bottom. When fire occurs it is recommended that it should be dealt with by means of sand or with sawdust impregnated with carbonate of soda, while in confined or dangerous spaces a chemical extinguisher should be used. As an additional precaution it is strongly recommended that there should also be an installation capable of discharging froth in large quantities into each boiler room, so arranged that it may be put into operation from a point situated outside the affected area. The flash-point of the oil is, of course, a matter for primary attention, and in this direction it is to be noted that Professor Brame's recommendations have been adopted. With all oils of the kind 150° Fahr. must be looked upon as the lowest safe flash limit, and a simple test has been devised whereby the chief engineer of the ship may satisfy himself that his fuel is above suspicion in this respect. Oil fuel not flashing below 150 deg. may be carried in cellular double bottoms under engine and boiler compartments and under ordinary holds.

The question of providing a vent is important. This is best effected by fitting to each tank an air-pipe, the top of which is led to the open air at a point where no danger will be incurred from the vapour which issues when the tank is full. As an additional precaution each vent should be fitted with wire gauze diaphragms, so arranged that they may readily be removed for cleaning or renewal. When a fire occurs the chief problem is to avoid it spreading. The main danger lies in collision or grounding, but even in such cases it should be possible so to insulate the boilers and funnel casings that the heat from even a fierce fire within the casings should not endanger surrounding woodwork or accommodation.

An Important Judgment

THE judgment given by Mr. Justice Peterson in the High Court on Wednesday against the Pharmaceutical Society is one of importance to all societies incorporated by Royal Charter. The theory of counsel that an incorporated society has power to do anything not expressly forbidden in its charter is, we believe, generally true; but it is a power subject to the right of any member to challenge acts which fall outside the provisions of the charter. This is what happened in this case. The plaintiff, Mr. A. H. Jenkin, a member of the Society and a chemist and druggist employed as head dispenser of the City of London and East London Dispensary, took exception to the Society's action in promoting the establishment of an industrial council committee for the drug industry, intended to regulate wages, hours and working conditions, and he asked for an injunction against the Society. The judge found in his favour, and an injunction was granted.

It may be said that the decision is unfortunate in that it prohibits the activity of the Society in a very desirable enterprise. Industrial councils are coming to be recognised as extremely valuable machinery for the regulation of all the conditions of industry, and bodies like the Institute of Chemistry have taken action to secure the due representation of chemists on such councils. How far this decision applies to such bodies as the Institute we shall probably learn later. The decision of Mr. Justice Peterson does not, of course, say that the work the plaintiff objected to is in itself undesirable work for such a society to undertake. That point was not raised. What he decided was that the operations referred to were outside the powers of the Society's charter, and, being objected to by a member, must cease. Even this does not finally stop the Society from continuing such work, for the necessary powers may be obtained by the registration of the Society as a trade union within the definition of Section 16 of the Trades Union Act of 1876. The decision will no doubt set many chartered societies inquiring afresh into the powers they are authorised and unauthorised to exercise.

A Settlement

As we go to press the welcome announcement is made that Thursday's meeti g between the Miners' Executive and the Government resulted in a settlement of the strike. This decision required to be referred for ratification to a national delegate meeting, with power to decide whether a third ballot should e taken. It is to be hoped that the later proceedings will be free from any hitch, and that by the time this s ue reaches our readers the settlement will have been completed.

The Calendar

Nov.		
1	Society of Chemical Industry (London Section): "The Photography of Coloured and of Distant Objects," by Sir William Pope. 8 p.m.	Institution of Mechanical Engineers, Storey's Gate, Westminster, London.
1	Royal Institution of Great Britain: General Meeting. 5 p.m.	Albemarle Street, Piccadilly, London
2	Hull Chemical and Engineering Society: "The Carbonisation of Coal," by R. Nelson. 7.30 p.m.	The Metropole, West Street, Hull.
4	Royal Society	Burlington House, Piccadilly, London
4	Manchester Municipal College of Technology (Dept. of Applied Chemistry): "High-Speed Electric Telpherage," by Herbert Blythe. 6.30 p.m.	Manchester.
4	Chemical Society: Ordinary Scientific Meeting. 8. p.m.	Burlington House, Piccadilly, London
5	Society of Public Analysts	Burlington House, Piccadilly, London.
5	Society of Chemical Industry (Manchester Section): "The Inorganic Constituents of Lancasgire Coal, by F. S. Sinnatt; "A New Process for the Vulcanisation of Rubber," by S.J. Peachey and A. Skipsey. 7 p.m.	Grand Hotel, Manchester.
6	Institution of British Foundrymen: "The Application of Pyrometers to Foundry Work," by W. Bowen.	College of Technology, Manchester.
16	Royal Colonial Institute: "Petroleum Resources of the British Empire," by G. Howell. 4 p.m.	Hotel Victoria, Northumberland Avenue, London

Canada's Growing Chemical Industry

A Review of Developments and Prospects

The following article is contributed by a Canadian correspondent, at present in London, who occupies a position which enables him to write with particular authority. From the facts brought forward it will be gathered that the future promises well for Canada's chemical industry, and that the immense resources of our oldest dominion are likely to undergo considerable development once the demand justifies the capital expenditure called for.

THE principal advances in the Canadian industry have been made in those branches which were directly affected during the war by the enormous demands made upon the Dominion for explosives and ammunition, and in this connection it may be recalled with advantage that in the year 1917-18 Canada shipped abroad, for the most part to the United Kingdom, explosives and cellulose products to the total value of $386,340,293, the corresponding figures for 1918-19 being $250,938,825. This export trade has, of course, practically stopped now, as the result of the cessation of active hostilities in Western Europe, but it is of interest to note that Canadian exports of drugs, dyes and chemicals of all kinds, which amounted to $1,730,203 for the fiscal year ended March 31, 1914, were last year $30,611,177, and that during the first three months of the current fiscal year the Dominion exported chemical and allied products (exclusive of explosives) valued at $4,618,842, as compared with $2,886,911 for the three months April to June of 1919.

Statistics are now in course of preparation at Ottawa with regard to Canadian chemical production in connection with the Census of Industry for 1918, but in the meantime it is known that the industry is being carried on in some 634 different plants, as compared with 255 officially classified as chemical works in 1915, and 178 in 1911. The capitalisation of the industry is not yet known accurately, but it is certain to be greatly in excess of the figure for 1915, when it was estimated at $52,248,588, and that for 1911, $26,926,124, the value of products in the two years mentioned being, respectively, $27,798,833 in 1911, and $45,410,486 for 1915.

Outstanding Developments

Possibly the most outstanding chemical development in Canada in recent years has been the manufacture of glacial acetic acid and its derivatives at the enormous plant at Shawinigan Falls, and there is little doubt that it is in the electro-chemical industries of the Dominion that future progress will be most remarkable. The cheapness of hydro-electric power in a country in which there is developed even now some 3,000,000 H.P. out of a total possible development known to be more than 20,000,000 H.P. must inevitably make Canada a formidable competitor with any chemical industry not so favoured by nature. The settlement that grew up at Shawinigan Falls, no mushroom camp, but a garden city in which the workers employed live and work under almost ideal conditions, was the consequence of notable hydro-electric developments on the St. Maurice River, on which there has been constructed one of the largest power reservoirs in the world, second only to the great dam at Gatun (Panama Canal). Here the world's largest glacial acetic acid plant was built for war purposes, an entirely new process beginning with acetylene having been discovered. Acetone, paraldehyde, crotonaldehyde, mercuric oxide, and manganese acetate were also produced, and metallic magnesium of a purity ranging from 99 per cent. to 99·9 per cent. is made electrolytically from its fused salts. Aluminium, successfully made at Shawinigan, proved a remunerative industry, and another plant, owned by United States interests, has been set up in the neighbourhood, in addition to works engaged on the production of steel by electric furnace. Acetone was also produced in Canada during the war by a new process direct from corn, an important by-product being turned out, butyl alcohol, which has been found to be an excellent substitute for fusel oil, and can be utilised for the production of a solvent which is a satisfactory substitute for amyl alcohol and kindred articles. The demand for acetic acid and acetone for the manufacture of munitions of war also stimulated the wood distillation industries of Canada, and not only was the output of these greatly augmented, but acetic anhydride, methyl acetate, and special grades of acetone-alcohol and acetone oils were added to the list of this industry's products. Up to recently both the production and the consumption in Canada of industrial alcohol have been meagre as compared with other countries, particularly the United States, one reason being the excise bonding system in force in the Dominion as in England; but the rapidly-increasing cost of gasoline, and the possible exhaustion of supplies so far as the United States is concerned within the lifetime of the present generation, has stimulated a considerable amount of interest in the possibilities of the Dominion as a producer of cheap alcohol for motor fuel.

Pulp and Paper Industry

Enormous quantities of sulphite liquor are produced annually by the rapidly-expanding Canadian pulp and paper industries, and some time back it was estimated that from this waste material some five million gallons of alcohol of 95 per cent. strength could be produced annually. The matter has been taken up by the Honorary Council for Scientific and Industrial Research, and as the result of the representations made to the Government by the Council, as well as by the various Chemical Societies, there is little doubt that legislative and other steps will be taken before long to place this important industry on a satisfactory basis, so that it will be in a position to cope with whatever demand may be manifested for industrial alcohol as the result of the coming developments in the utilisation of that commodity.

Hydro-electric development, to which reference has already been made above, has rendered possible chemical production, not only at the Shawinigan Falls and elsewhere, but also at the world-famed falls on the Niagara River, where, as explained recently in THE CHEMICAL AGE by Dr. W. S. Landis, it has been most successfully adapted to the manufacture of fixed nitrogen in the form of calcium cyanamide, the lime-nitrogen fertiliser, and to its conversion into valuable ammonium salts, as well as into the cyanides so largely used in the Canadian and the United States mining and metal-refining industries. Electro-chemical developments on a large scale are possible before many years in the Temiskaming district of Ontario, and the magnificent resources in this regard of Manitoba and British Columbia as well are likely to be harnessed by the enterprising chemical engineers in our oldest Dominion as soon as the demand for the products justifies further expenditure of capital in this direction.

While Canada is abundantly supplied with bituminous coal, and some progress has been made in the matter of the exploitation of coal tar derivatives, it is not considered probable that the Dominion will in the near future be a serious competitor of Germany, the United Kingdom, or the United States in the output of aniline dyes. In the field of medicinals, however, important progress has been

accomplished, and both dyestuffs and intermediates are also turned out in the Trenton (Ontario) plant of Chemical Products, Ltd., an erstwhile munitions factory which is assuming a notable position in the Canadian chemical industry. Salicylic acid and its well-known derivative aspirin are now made on a large scale by this company, and Canada bids fair to become one of the largest producers in the world of a product which was at one time a German monopoly. With new equipment installed not long since, the Chemical Products Company anticipates an annual production of 1,080,000 lb. out of a world demand estimated at present to be about 6,000,000 lb., and it is considered that the Dominion is in a good position to supply the large American market, not to speak of the British Empire and the Far East. In addition to aspirin, Canada now produces phenacetin, coumarin, benzoic acid, benzoate of soda and benzaldehyde. The distillation of coal tar for disinfectants is carried on extensively, and a further use of coal-tar products is in the preservation of wood by creosoting and in the manufacture of tarred felts, as well as the various grades of tar and pitch used in roofing, paving, waterproofing and road treating. The forthcoming exploitation of the " tar-sands " of Northern Alberta in connection with the search for oil will, no doubt, give rise to important by-product industries.

Heavy Chemicals

In the field of heavy chemicals important progress has been made which will materially affect the import returns in many staple commodities. Several new acid plants have sprung up, and facilities for the production of sulphuric nitric and mixed acids have been largely increased, particularly by the developments, to which reference has already been made, at the Trenton plant of Chemical Products, Limited. One firm in Canada now produces hydrofluosilicic acid, another picric acid, and another molybdic acid ; and soda ash has now a Canadian home at Amherstburg, Ontario, where Messrs. Brunner-Mond, Canada, Limited, have installed a plant to manufacture for the first time from hitherto unexploited resources of the Dominion a product of the greatest importance to the development of her industrial and commercial life. Soda enters to a great extent already into the manufacture of wood pulp, paper, chemicals, drugs, paints, leather, enamelled ware, in the refining of vegetable and mineral oils, and in metallurgical operations, all of which have vastly increased in importance in Canada in recent years, and the consumption of soda ash in the Dominion is probably by now considerably in excess of 50,000 tons annually. The manufacture of wood pulp by the soda process is likely to supersede to a large extent the existing sulphite and sulphate processes by reason of the greater value of the by-products of the former method of production, and these by-products in turn will assume an important place in the world's markets in view of the dominant position to which Canada has attained in the manufacture of pulp and paper. Raw materials for the soda industry abound in the Dominion, the plant at Amherstburg being adjacent to important salt deposits ; but the rise of the new industry has brought about much interest in the hitherto useless alkali deposits of Western Canada. At Fusilier, Sask. ; at Ceylon, Sask. ; at Dana, Sask. ; and at Minburn, Alberta, developments are already proceeding of the sodium sulphate deposits available there, great quantities being obtainable. The Ceylon deposit particularly is estimated to contain 9,000,000 tons of Glauber salts, 98 per cent. pure, and the Fusilier disovery is placed at not less than 2,000,000 tons.

Production of Fertilisers

Conspicuous among the Canadian chemical industries which have undergone development during the war is the manufacture of fertilizers, which was in its infancy in 1914. Canadian agriculture is still very largely based on the obvious virtues of virgin soils, but the present and prospective market in the Dominion for chemical fertilizers is enormous, and the vast output of sulphuric acid during the war brings the manufacture of superphosphates on a considerable scale into the realm of Canadian possibilities as soon as a supply of phosphate rock in larger quantities than at present becomes available, sulphur itself being abundant in the Dominion. The output of superphosphates in 1918 was 641 tons, valued at $19,230, but in 1917 some 7,298 tons were produced, worth $207,769. The total output of chemical fertilizers in Canada in 1918 was $2,558,007, in addition to large quantities of fertilizing material derived from meat-packing establishments. Canadian coke plants produce thousands of tons of sulphate of ammonia, most of which is shipped to the West Indies and the United States for the sugar and cotton plantations. The production of cyanamide at Niagara Falls has already been mentioned, and exports of this commodity last year amounted to $4,422,797, the plant having been in operation throughout the year, mainly on export orders. A special investigation into the Canadian fertilizer industry for 1919 is now in progress,and interesting details will no doubt shortly be published.

Great progress has been made during the war in the field of metallurgy, and particularly in electro-metallurgy. Silico-manganese for use in the manufacture of manganese steel, and high-grade ferro-silicon for the use of the British Admiralty as a source of hydrogen were new lines developed by one firm as a result of the war demand. Many new electric furnaces for the manufacture of steel, tin, &c., have been installed, and antimony is shortly to be produced by a plant in New Brunswick. The refining of Canadian nickel has been undertaken at five different plants, and graphite crucibles were successfully made for the first time during the war. A great deal of interest is at present being taken in the question of the development of the vast Canadian deposits of low-grade iron ore, particularly in Hastings County, where hydro-electric energy is available at low cost in close proximity to the mineral deposits, and, in view of the recent discoveries of Professor Stansfield as the results of experiments made on behalf of the Honorary Council for Scientific and Industrial Research, it is felt that great developments in the electric reduction of iron ores are likely in the near future. The Canadian iron and steel industry is at present dependent to an alarming extent upon imported ores, which together with iron and steel products, constitute an importation amounting to $150,000,000, which materially assists in depressing thevalue of the Canadian dollar when it crosses the border.

By the award of a grant of $5,000 to Professor J. C. McLennan to assist him in his investigations of the properties of helium, the Honorary Council for Scientific and Industrial Research hopes to see accomplished a satisfactory method of conserving this gas, so important to the air balloon industry, of which it is believed that 1,000,000 cubic feet per month are at present being wasted, particularly in the Bow River natural gas field in Southern Alberta. Canada is the only part of the British Empire known to possess helium resources, and an important industry is one of the many possibilities for the Dominion within the next few years.

Concluding this survey of the Canadian chemical industry it will, perhaps, not be out of place to refer to the great growth which has taken place recently in many established industries, such as the manufacture of paints, colours and varnishes, sugar, chocolate, calcium carbide, glass, glycerine, leather, lacquers, oils, cement, match materials, rubber goods, soap, &c., in all of which the chemist plays an important part.

The Physics and Chemistry of Colloids

Joint Conference of the Faraday and Physical Societies

An important conference, convened jointly by the Faraday and the Physical Society of London, was held on Monday last in the Hall of the Institution of Mechanical Engineers, London, to discuss "The physics and chemistry of colloids and their bearing on industrial questions." The papers, of a highly technical character, treated the subjects from many different points of view, and were followed by the large audience with great interest. Abstracts of the papers with a brief report and the discussions are given below.

SIR ROBERT HADFIELD, president of the Faraday Society, in opening the conference, referred with pleasure to the presence of Dr. The Svedberg, Professor of Physical Chemistry at the University of Upsala, and said the world owed a great debt to the Swedish scientists of the seventeenth and eighteenth centuries. He welcomed such symposia as that in which they were taking part, in which more than one society participated, on account of their value from a national point of view. In the past, our learned societies had perhaps acted rather selfishly in the way they had concentrated on their particular line of work, and closer relations were desirable.

The chair was afterwards taken by Sir William Bragg, president of the Physical Society of London.

A Short Survey of the Physics and Chemistry of Colloids

By Dr. Svedberg

In his opening paper, Dr. Svedberg said the science of colloids was a science of the microstructure of matter. In it was reflected the tendency of modern natural science to deal more and more intensely with the problem of structure in its full extent. In the great science of the structure of matter, the science of colloids formed the domain that lay above molecular dimensions and beneath macroscopic dimensions. In this domain were a great number of those systems which were the basis of material culture and of life as a whole. All living beings were built up of colloids; almost all foods, articles of clothing, and building materials were colloids; or, to mention some special systems, protoplasm, proteins, glue, starch, all kinds of fibres, wood, brick, mortar, cement, certain kinds of glass, rubber, celluloid, &c. The importance of colloid science for many industrial questions was, therefore, beyond all doubt.

The science of colloids, he continued, is a rather young one. The field of study which it concerns has for a long time been disregarded. In order to be able to treat with success all the questions presented to us by industry, there is still much to be carried out in the department of pure colloid science. We will try to fix our attention on two principal problems: (1) the formation of colloids, and (2) the changes of structure in colloid systems.

The Formation of Colloids

The formation of a colloid may be effected in two ways, different in principle, viz., by condensation and by dispersion, according as one tries to obtain a microstructural system, a colloid, from a molecular structural or a macrostructural system.

In the case of a condensation process, the degree of "graininess" or the degree of dispersion will become higher as the degree of supersaturation increases; which must, of course, always precede condensation. This is the case when fogs are formed by adiabatic expansion of gases, *e.g.*, cloud-formation in the atmosphere, when metal colloids are prepared by condensation of metal gas from the electric arc, when a slightly soluble substance, *e.g.*, barium sulphate, is precipitated by means of a reaction between ions. The condensation always proceeds from certain heterogenities in the medium; condensation centres or nuclei. As such nuclei, we may have particles of the substance which is to be formed by the condensation, *e.g.*, precipitation of gold on small gold particles, when preparing gold hydrosols or gold ruby glass, or gas ions, *e.g.*, fog-formation in gases at low degrees of supersaturation, or complex molecules, *e.g.* fog-formation in gases at high degrees of supersaturation. The manner in which these nuclei are introduced into the system under condensation is of great importance for the degree of dispersion of the colloid resultant. If the nuclei are not introduced into the system all at once, but gradually in the course of the condensation process, the particles will be very unequal in size.

The biologically important colloids, *e.g.*, the proteins, are evidently all formed by condensation, but no details of this process are known. The tendency towards condensation manifests itself in the fact that even the protein molecules are, from a purely chemical point of view, condensation products.

In case of a dispersion process, there is always work to be performed against the surface tension or the cohesion force. Accordingly, such a process is, in contradistinction to a condensation process, a forced and not a spontaneous one. We know very little as to the relation between degree of dispersion and experimental conditions. When emulsifying fats and hydrocarbons, the surface tension may be lowered by the addition of small quantities of alkalies or soaps. Grinding, in general, does not lead to a very high degree of sub-division; but it is possible to increase the latter by adding an indifferent solid diluent which can easily be dissolved and removed, leaving the disperse phase suspended in the solvent used. Thus, colloid sulphur has been prepared by grinding sulphur with urea and putting the substance in water. A combination of grinding and chemical effects on the material may also be used. It seems that, in many cases, a prevention of the aggregation of the particles by means of suitable additions ought to render possible the preparation of high disperse systems by pure grinding.

Changes of Structure

A newly-formed colloid may, immediately after its formation, undergo changes of structure of a more or less profound nature. On the other hand, it is nearly always possible to prevent the occurrence of such changes, and therefore we have a right to distinguish and investigate the *primary structure* as the direct result of the colloid-forming process. Colloids with primary structure may conveniently be called *primary colloids*.

We have at our disposal several methods for the closer study of the structure. The most important and most obvious means is the microscope and the ultramicroscope. A means of deciding whether the particles are symmetrical is to be found in the study of the behaviour of the colloids in magnetic or electric fields. Non-symmetrical particles are oriented by such fields and thereby impart to the colloid a certain, though in general very slight, degree of double refraction, which may easily be measured with great accuracy. In this way, we have been able to settle that the particles in common sulphur hydrosols, prepared by oxidation of hydrogen sulphide, are spherical; but sulphur hydrosols, prepared by grinding sulphur with urea, are dissymmetrical. The particles in gold hydrosols prepared by reduction are dissymmetrical to a high degree.

Two other optical properties, viz., the light absorption and its accompanying phenomena, the scattering and polarisation of light, may also in certain cases be used for structure studies. Theory, as well as practice, proves that these phenomena are, for instance, dependent to a great extent on the degree of dispersion of the sol.

The resistance exerted on the particles by the surrounding medium when they move under the influence of a force is a means of investigation that is now often used for the determination of the size of the particles. In some cases, *e.g.*, when a sol is filtered through a membrane of collodium or gelatin, the connection between the resistance and the size of the particles is not known in detail, but we are justified in assuming that the resistance rises with the size of particles. The small particles are more rapidly pressed through the filter than the large ones. Certain kinds of filters transmit molecularly dissolved substances, but not colloids; an important method of separation, especially in biochemistry. If

a colloid is separated from a great quantity of dispersion medium by such a membrance, the molecularly dissolved substances—the crystalloids—diffuse through the membrane, leaving a colloid of a purer state.

Owing to the fact that the size of the particles is rather great in comparison with that of the molecules, colloids diffuse very slowly compared with crystalloids. As a matter of fact, Graham, the founder of colloid chemistry, regarded this property as the fundamental difference between colloids and crystalloids.

The size of particles may also be determined by measuring the sedimentation equilibrium, *i.e.*, the distribution of the number of particles per cubic centimetre under the joint influence of gravity and the Brownian movement. In this equilibrium, the concentration of the colloid diminishes exponentially with increasing height, as is the case with the atmosphere surrounding the earth.

It often occurs that the particles of a colloid are too small to be measured directly—*e.g.*, by means of the ultramicroscope or by determining the velocity of sedimentation. In some of these cases one can overcome the difficulty by depositing gold on the particles, thus increasing their size. This method has already been applied to sols of almost all the metals and to sols of some sulphides. If the quantity of gold on a particle is known, it is easy to calculate the radius in the usual manner.

In most colloid solutions and precipitates there are particles of various sizes, and the investigator should, of course, be able to determine not only the mean size, but also the real structure of the sol—*e.g.*, the law governing the distribution of the various sizes of particles. Among the phenomena reviewed above only the velocity of sedimentation, the sedimentation equilibrium, and the Brownian movement have been used in studying the distribution of the size of the particles. On the basis of the former phenomenon just mentioned a method has been worked out which has already provided us with much valuable information as to the formation of the various particles in colloids and the agglomeration processes taking place in them.

Viscosity of Sols

The viscosity of a sol depends, in a manner not yet known, on the size of the particles, the concentration, &c., but above all on the nature of the particles. Small particles probably have relatively thicker water-coverings than greater particles, and, accordingly, the viscosity is higher in a fine-grained colloid than in a coarser one, provided the two sols have particles of the same material and are of the same concentration by weight—(*e.g.*, sulphur hydrosols). When the potential difference between particles and fluid is altered the thickness of the water-coverings should alter, and, as a matter of fact, the viscosity is altered too. As the water-covering increases, the particle will act more and more like a drop of fluid in relation to the surrounding medium and will, therefore, as far as the viscosity is concerned, approach more and more to the limiting case which is represented by an oil emulsion.

The phases—two or more in number—in a disperse system have a contact surface very large relatively to the volume of the system. It is obvious that in such circumstances adsorption plays a prominent *rôle*. The adsorption of different substances differs in strength. If an electrolytically-dissociated salt is adsorbed, cations and anions are, of course, brought together at the contact surface in equal numbers, but the adsorption of the particles in relation to cations and anions is most often unequal, inasmuch as one is present in excess nearest to the surface of contact and the other in excess some way out in the liquid. The result is the ormation of an electrical potential difference, a so-called adsorption potential difference or an electrical double-layer. Because of this the disperse phase, when exposed to the influence of an electric field, will migrate towards one of the poles, provided it is freely movable, as in the case of a colloid solution (cataphoresis). If the disperse phase is immovable, the liquid will move in the opposite direction (electrical endosmose).

The changes of state which may occur in a disperse system, a colloid, are essentially changes of structure. Of course, purely chemical reactions, too, are to be taken into consideration, but they do not play such a prominent part here as in the molecular structural systems. The most important change of state is the uniting together of the single particles (primary particles) into aggregates (secondary particles). Such an aggregation often occurs directly after the formation of the particles. It may stop for various reasons after the aggregates have reached a certain size. The result is a colloid with complex particles—a *secondary colloid*. If the aggregation goes on further we may have two extreme possibilities—with many transition forms.

The most important cause of the aggregation of the particles is the decrease or the disappearance of the difference of potential between particle and liquid. This may be effected by altering the ion adsorption. Hence one of the most important means of bringing about aggregation or disaggregation is *addition or removal of ions*. Because of the opposite electric and coagulating action of anion and cation and their difference of adsorption there will always exist, for certain electrolytes in relation to a certain colloid, a domain of concentration within which they have a disaggregating action. If a solely aggregating electrolyte is added to a colloid in increasing doses—*e.g.*, hydrochloric acid to a gold hydrosol, the velocity of aggregation first rises rapidly with concentration, then more slowly and reaches a constant maximum value. Let us make the assumption that within the latter region *every* mutual approach of two particles to a certain limit leads to aggregation, but within the former region only a certain *fraction* of those approaches. Then it is possible to develop, on the basis of the laws of the Brownian movements alone, a mathematical theory for the kinetic of aggregation.

In the preparation of easily aggregated colloids a protective colloid is often added in order to maintain the primary structure. Thus the particles of a metal hydrosol, if formed in the presence of a small quantity of a protective colloid, are kept apart even when the sol is evaporated to dryness. The dry substance can be redissolved in water without any perceptible change of structure taking place—*e.g.*, commercial colloid silver.

A change of structure that plays a part, formerly a little overrated, in colloid solutions with comparatively easily soluble particles is the growth of the larger particles at the expense of the smaller ones. In a suspension of calcium sulphate this change of structure is clearly visible, but in the more sparingly soluble barium sulphate the process goes on at an extremely slow rate. Formerly, aggregation, especially the irreversible process, was often interpreted as a recrystallisation. In irreversible aggregates as well as in compressed powders there gradually take place association and crystallisation phenomena which may greatly change the structure of the system—*e.g.*, silver crystals in sediments from silver colloids.

The study of the structure of gels is a rather difficult one. The particles of most gels do not contrast optically to any great extent with the surrounding medium, and consequently the ultramicroscope is not able, as a rule, to make their primary particles visible. Moreover these are often packed together so closely that they cannot be distinguished from one another optically. On the other hand, we have been able to study with more success the macroscopic properties of the gels in chemical and physical respects. The elastic gels, especially gelatin, collodion, celluloid, rubber, &c., play a prominent part in industry, and their investigation is therefore a matter of great importance.

Emulsions and Emulsification

Professor F. G. Donnan, F.R.S., who opened a discussion on "Emulsions and Emulsification," said that emulsions were closely connected with colloids because thay had the same disperse systems although on a coarser scale. Emulsions changed in two ways, viz., by the breaking down and recoalescing of the disperse globules and by creaming. He referred to the work of other investigators in this direction and the explanations which have been put forward and mentioned work that is to be undertaken in connection with transparent gels.

Emulsion Problems in Margarine Manufacture

By William Clayton, M Sc.

Margarine manufacture offers a splendid field for colloid research in several directions, but particularly in emulsions, both liquid and solid. Practically no published work appears on solid emulsions like butter and margarine, and as regards liquid emulsions, practice in margarine manufacture has

followed empirical rules rather than definite physico-chemical conclusions.

The present discussion may conveniently include three main points in the making of a margarine emulsion: (*a*) Factors depending on the degree and mode of agitation employed in mixing. (*b*) Factors depending on the animal and vegetable oils and fats used. (*c*) Factors depending on the water, milk, and other ingredients employed.

Two types of emulsifying machines are in common use in margarine manufacture. The first is essentially a jacketed tank, permitting temperature control by circulating either hot or cold water. Milk is admitted to the tank, and then the oil mixture slowly run in, whilst constant agitation is maintained—*e.g.*, by means of rapidly-revolving baffle plates. It is absolutely essential to run the oils into the milk, and not *vice-versa*. Thus a fine-grained emulsion results, of the oil-in-water type, which on cooling to 24°C. (with constant agitation) becomes remarkably permanent. The more slowly the oil is run in, the better the results obtained.

If on the other hand the oils be in the churn in bulk and the milk run in, an emulsion of the water-in-oil type ensues. The same thing happens if both phases are placed in bulk in the churn (say 80 per cent. oil and 20 per cent. milk) without undue mixing, and then the agitating device set in motion. On consideration of volume factors alone, it will be evident that if one has the oil phase in bulk and milk is introduced, stirring continually, the conditions from the purely mechanical aspect of disintegration of particles favour the formation of the water-in-oil type of emulsion. Such an emulsion is not "permanent." As soon as the agitation ceases, separation into layers occur, owing to the fact that the very nature of the emulsifying agents present, viz., milk colloids, demands the oppositely-phased system.

The second type of emulsifying machine aims at the *continuous* production of emulsions, whereby there is economy in space, time, and power. The principle underlying continuous churns is the simultaneous admission of the oils and milk into a thermo-regulated chamber, whence, after some suitable device has ensured intimate mixing, an emulsion is discharged in a continuous stream. It is at once apparent that the same degree of freedom of the control of physical or mechanical factors is not permitted with this churn as with the older tank type. In my experience, even when using milk and oils—*i.e.*, when the purely *physico-chemical* conditions are satisfied, different *mechanical* treatments may lead to either the oil-in-water or water-in-oil type of emulsion. Sometimes, the passage through a continuous churn (wherein blades revolving 1,500 revs. per min. cause violent agitation) of a margarine emulsion of the oil-in-water type, will completely reverse the type of emulsion. Probably volume factors exercise a marked influence in such inversions.

The effects of different methods of agitation, and the degree of any one kind, on a mixture of oil and an aqueous phase, deserve far more attention than hitherto given. Undoubtedly one can both make and "break" an emulsion by agitation. Thus Sheppard, working on the emulsification of nitrobenzene in sulphuric acid found that "de-emulsification was accelerated by slow shaking or even single vibration in some cases, for emulsions which remained stable at rest, while shaking gently at a slightly higher frequency would re-emulsify to a system again stable at rest."

The prevalent idea regarding emulsification in general, and margarine churning in particular, is to agitate the mixture of milk and oils as violently as possible. Such agitation, it has been argued, results in the formation of very small globules, a most desirable feature in a stable emulsion. Consequently an empirical limit only is set on the degree of stirring up an emulsion. Shaking is an inferior method of making emulsions, because as the emulsion becomes more perfect, the smashing action between the relatively heavy and light particles becomes more feeble, whereas the smashing forces should be increased.

The solid fats used in margarine manufacture include stearine beef-jus, oleo, lard, palm-kernel oil, and cocoanut oil, whilst the liquid oils include cottonseed, arachis, soya, rape, sesame, &c. A margarine mixture may include from three to six of these ingredients, so proportioned as to give a melting-point of about 26°C. Experiments have been made to inquire whether these various ingredients were alike in their capacity of being emulsified, or whether by a suitable choice of oils and fats, a margarine mixture could be obtained which would with greater ease give an emulsion of more than the usual stability.

It is the practice to add salt to margarine during the final stage of blending. In the use of the author's invention, of a machine for the continuous production of margarine, the salt is added in solution in the milk during emulsification.

Emulsifying agents are frequently added to the milk or oil in margarine manufacture, and numerous patents for such additions exist—*e.g.*, egg-yolk, lecithin, gelatin, glycerine, albumin, &c.

It is evident that extensive investigations require to be made before a thorough account of a margarine emulsion is complete. It is probably the most complex emulsion system in industrial practice. The oils and fats are not emulsified with water only (except in special cases, *e.g.*, "pastry margarines") but with milk, and this milk has been artificially soured by the action of lactic acid bacterial. In the milk there is lactic acid, milk colloids, lactose and solid clots of casein. What the effects of these substances are on the emulsion is a field for further research.

Reversal of Phases in Emulsions

By S. S. Bhatnagar

In his paper on "Reversal of Phases in Emulsions and Precipitation of Suspensoids by Electrolytes," Mr. Shanti Swarupa Bhatnagar said that a complete stydy of the effects of electrolytes, the degree of dispersion, and the distance between the particles in these emulsions, pointed to the conclusion that the character of emulsions as model suspension colloids was not destroyed by using soap solutions as stabilising agents, and that the latter might be regarded merely as protective colloids. The complete parallelism between the reversal of phases in emulsions, and the precipitation of colloid sols in suspensions, suggested that the cause or causes operating to produce such identical effects might also be identical. A thorough study of emulsions and a comparison of the large amount of data already obtained on simple and well-studied colloidal sols (like gold, As_2S_3, &c.) in the light of complete parallelism between the two, might lead one day to the clearing up of the mystery of coagulation and prepare a way for a rational theory of colloidal solutions and emulsification.

Apart from the theoretical interest of the problem, a thorough study of the effects of electrolytes on the stability of soap emulsions was likely to be of great practical value. For example, the differences in the amount of electrolytes required to bring about the reversal of phases with different soaps pointed to the probability of a difference in their protective actions. The old hypothesis of Chevruel that the cleansing power of soap was due to the free alkali liberated was now discarded in the light of recent extensive investigations of MacBain. According to the modern conception the washing power of soap was due to its emulsifying efficiency, or, better, to its protective action, which kept the dirt and grease bound in the form of an emulsion. A complete investigation of the emulsifying efficiency of various soaps for the more common dirt, like dust, soot and grease, would be of very great practical importance for the soap industry.

Physical Properties of Elastic Gels

By Emil Hatschek

In his paper on this subject Mr. Hatschek said that the statement that the familiar table jellies (gelatin gel) were typical representatives of the class to be discussed in the present paper would probably, at the outset, be found more useful than an attempt at strict definition. These systems exhibited immediately two of the most characteristic properties of the elastic gel: stability of shape, notwithstanding a very high content of liquid (about 95 per cent. in the case quoted) and perfect elasticity within certain narrow limits.

The gel, he continued, may be obtained in two opposite ways: either by transformation—which may be reversible or irreversible—of a sol—*e.g.*, by cooling a gelatin sol below a certain temperature; or by allowing the dry substance to "swell" in an appropriate liquid. Practically all substances from which elastic gels may be produced show this capacity of swelling, though to an extent which differs widely. Only certain liquids will cause a given substance to swell, and the relations between the constitution of the solid and the liquid, on which this property is based, are at present quite obscure. Thus gelatin and agar (the former a protein, the latter a mixture

of carbohydrates) swell in water at ordinary temperature, but do not dissolve until the temperature is raised. Vulcanised india-rubber swells in various organic solvents such as benzene, toluene or xylene, without dissolving. Finally, the processes of swelling and dispersion or solution may proceed *pari passu*, as with gum arabic at ordinary temperature. At low temperature, a definite stage of swelling may be observed to precede solution.

The elastic gel which can be most easily reproduced and has, accordingly, been studied most frequently and extensively, is that of gelatin. Bodies of any desired shape can be obtained by pouring the gelatin sol into suitable moulds and allowing it to set for a period of not less than 24 hours. The procedure, once chosen, must be rigidly adhered to throughout, since all the properties of a gel depend, not only on its composition, but also to a marked extent on its history, especially its "thermal history," *i.e.*, the temperatures to which the sol has been exposed and the duration of such exposure. Some of the principal investigations will now be briefly summarised.

Elastic Properties

These have been studied principally by R. Maurer, P. v. Bjerken, E. Fraas, and A. Leick. All these investigations date back some time, and were undertaken with a view to studying a material with very low modulus and sufficiently transparent for examination in polarised light, rather than with the intention of elucidating such problems as the structure of gels. Both Maurer and Leick determined Poisson's ratio for gels of various concentrations and found it 0·5 within the limits of error—a result which is not surprising in view of the large percentage of liquid. Maurer studied the elongation of gel cylinders of considerable diameter (2·21 cm.) with small loads, the extensions being measured microscopically. His figures for the modulus are in good agreement with those found by Leick, which range from 2·42 (gm/mm²) for 10 per cent. to 29.4 for 45 per cent. gels. Leick found the modulus E roughly proportional to the *square* of the gelatin concentration; the ratio E/c^2, however, varies somewhat irregularly, and decreases with increasing c. All the investigators find that the modulus increases with increasing load.

Fraas studied the ageing of gels and found that a constant modulus was not reached until about 24 hours after apparently complete setting. These hysteresis effects are universal in colloidal systems, and the increasing modulus of a gel is paralleled by the increasing viscosity of the sol, when kept at a temperature above the setting point. In the following table one series of Fraas's results is given to illustrate the magnitude of the effect.

Cylinder of 20 per cent. Gelatin Gel.

Hours after removal from mould	1	2	3	4	5	6	7	24
Extension produced by 50 gm. weight	12·5	7·5	7	7	6·5	6·5	6	5

Maurer, and more particularly Leick, also studied the effect of various substances dissolved in the water on the elastic modulus of gelatin gels; the results are of particular interest from the colloidal point of view, inasmuch as they can be co-ordinated with the well-known effects of such solutes on other properties of the system, *e.g.*, maximum swelling, setting point of sol, etc. Leick finds that the addition of various chlorides lowers the modulus, sodium sulphate is without action, while cane sugar and glycerine raise the modulus considerably. Chlorides also lower the viscosity and setting temperature of the *sol*, while glycerine and cane sugar (generally substances containing hydroxyl groups) raise both constants.

The elasticity of gels is perfect only for small loads applied for a short time, but very little work has been done on relaxation in such systems. R. O. Rankine maintained gelatin gels of low concentrations (3·4 to 4·5 per cent.) at constant strain and plotted the stress necessary to do this against time. The stress, within the limits of concentration and time investigated, never becomes zero. Breaks occur in the time-stress curves, which are taken to indicate that the elastic limit has been reached. The concentrations employed by Rankine are very much lower than those at which determinations of the modulus, &c., have been made.

Reiger determined the relaxation time of gelatin gels by optical means (disappearance of the double refraction produced by strain). The investigation was undertaken with the object of testing Maxwell's relation between modulus, viscosity and relaxation time, and was accordingly carried out at 29° C., *i.e.*, at a temperture very near the "melting point" of the gel. In these conditions Reiger found a relaxation time of 10 minutes for 20 per cent., and about 41 minutes for 40 per cent. gel.

That the conditions are entirely different at lower temperatures is shown by experiments by the writer, published here for the first time. Rectangular prisms of gelatin gel (10 per cent.) with 1 per cent. of sodium fluoride, to prevent putrefaction, were cast and allowed to set for 36 hours before removal from the mould. One of these prisms was then bent between three stops fixed on a glass plate, the latter being covered with paraffin oil to prevent adhesion of the gel and consequent irregular deformation. The specimen was then photographed in polarised light (double plate glass as polariser, Nicol as analyser) within 10 minutes of the application of stress at room temperature, about 15° C. The glass plate with the specimen was then placed in a moist chamber for five days, being examined at intervals (visually) without any noticeable change showing itself. At the end of five days the stress had practically disappeared, so that the specimen could be removed without friction and without straightening itself appreciably. It was then again placed on an oiled glass plate and photographed as before. Considering the extreme sensitiveness of 10 per cent. gel to deformation, it may be said that the appearance is substantially unaltered, and that at any rate the optical anisotropy caused by strain has not disappeared with the removal of the stress. The absence of relaxation in a system consisting to about 90 per cent. of liquid is certainly remarkable and will be referred to again.

Optical Properties

The double refraction produced by deformation has been referred to incidentially in the preceding paragraph. Quantitative investigation of this property has been carried out chiefly by Leick. His principal results (obtained with gel plates in tension) are: (1) the double refraction ($D = n_e - n_o$) is, *caeteris paribus*, very approximately proportional to the strain, and (2) for equal relative elongations the double refraction is roughly proportional to the gelatin content.

The refractive index of both gelatin sols and gels has been shown by G. S. Walpole to be a linear function of the gelatin concentration. If the refractive index is plotted against the temperature over a range containing the setting point, no discontinuity occurs at the latter, *i.e.*, when the sol is transformed into gel.

On the whole, our knowledge of the elastic and the related optical properties of gels must be pronounced slight. As in other branches of the subject, non-aqueous systems have received hardly any attention; their study is eminently desirable, as the enormous complications introduced in the case of a protein like gelatin by the formation of salts, and their electrolytic and hydrolytic dissociation, would be absent. There is a very large literature on the stress-elongation curve of india-rubber, which, however, refers only to the dry material and is not of immediate interest. The writer has found only one reference to a rubber gel in a paper by A. E. Lundal, who determined the tensile modulus of rubber which had imbibed 133 per cent. of paraffin oil and found it about one-half that of the dry material.

Diffusion in Gels

This phenomenon has, for various obvious reasons, received a considerable amount of attention. Thos. Graham already used dilute gels instead of pure aqueous solutions in the study of diffusion, and found the rate approximately the same in both. This, however, only holds good of gelatin gels up to, say, 3 or 4 per cent. and agar gels under 1 per cent. In more concentrated gels the rate of diffusion decreases markedly with the concentration, but no quantitative relations have, so far, been determined. The rate of diffusion for a given solution and gel concentration can be affected by various solutes in the latter. Among the earliest investigations on the point are those of H. Bechhold and J. Ziegler, who found $NaCl$ and Na_2 without effect; Na_2SO_4 and several non-electrolytes as dextrose, glycerine and alcohol reduced the rate

of diffusion of certain solutes. A certain—though not exact—parallelism shows itself between the effect of solutes on the elastic modulus and the rate of diffusion: substances which increase the former reduce the latter. The experimental difficulties are very considerable.

The fact that both the swelling and the drying of gels are controlled by diffusion involves some consequences which, considering that they may have an important bearing on histology and related subjects, have not yet received adequate attention. If a body of gel is bounded by a surface in which the radius of curvature changes very quickly or (as in polyhedra cylinders bounded by plane ends, &c.) discontinuously, diffusion to or from regions adjacent to tracts of surface with low or zero-radius takes place more rapidly than from the rest. The result is that a body of gel does not remain similar to itself during swelling or drying, but undergoes successive deformations which may be considerable. The effect is particularly marked in drying; thus, cylinders with plane ends at first dry more rapidly round the circular edges, which contract, the profile becoming that of a barrel with convex ends. As the material forming the edges becomes less permeable, the large surfaces dry more quickly, and the final shape is, approximately, a single-shell hyperboloid with concave ends. On allowing such a body of dry gel to swell again, the original shape is not necessarily restored; the reason for this alteration in the capacity of absorbing water is obscure.

Two Problems for Solution

The foregoing summary—though necessarily restricted by considerations of space—may give the reader unfamiliar with the literature some idea of our present knowledge. The two great problems to be solved must now be set forth briefly. They are (1) the elucidation of the structure of elastic gels, and (2) the explanation of the phenomenon of swelling. As regards the former, there is at present a fundamental divergence of opinion, inasmuch as some authors maintain the elastic gels are *homogeneous* systems, *i.e.*, solid or "semi-solid" solutions. The evidence for this view is set forth at length in a very exhaustive monograph by Katz. The other school considers gels to be heterogeneous systems, but differ regarding the state of aggregation of the phases. Ostwald, in particular, considers gels to be *systems of two liquid phases* having an interfacial tension, while some of the other investigators incline to the view that the properties of gels are best accounted for by assuming some sort of network or cellular arrangement of *solid* phase permeated by liquid. Speaking generally, these rival theories are based on the consideration of a limited number of selected properties, and a great deal of further work is required, probably on quite novel lines, before a definite conclusion commanding universal acceptance can be reached. The author feels, in particular, that the elastic properties have received insufficient attention, and has attempted, as a first srep, to examine whether they are compatible with the assumption of two liquid phases possessing interfacial tension, the result being negative if the assumptions necessary to allow of mathematical treatment are granted.

As regards the phenomenon of swelling, we have at present no explanation whatever why certain substances swell in a comparatively limited number of liquids. In the case of proteins, which have received the greatest attention, conditions are enormously complicated through salt formation and electrolytic and hydrolytic dissociation and here, as in other problems of colloid chemistry, substantial progress is to be expected only from the study of non-aqueous systems, of which a large number is certainly available. This is also the view expressed by Katz in the monograph already quoted: "Swelling in organic solvents would, perhaps, be more important for an investigation in the service of pure physical chemistry than swelling in water." It is greatly to be hoped that the present discussion may induce competent workers to examine this—equally neglected and promising—field.

Professor PROCTOR referred to work that is being carried out in his laboratory upon the surface tension lowering of sulphonated oils, a practical question to the leather trades. These experiments, he said, had been carried out by the ordinary drop method and had proved that surface tension was largely dependent upon the exact degree of hydrion concentration.

The Reversible Sol-Gel Transformation

By S. C. Bredford

In order (Mr. Bredford stated) to understand fully, the reversible sol-gel transformation it seems necessary to know the true relation of sols to ordinary solutions. A gradual transition in properties from coarse suspensions through sols to true solutions is generally assumed. This does not readily suggest an explanation of the marked differences in behaviour to electrolytes which occur. It seems probable, however, that sols are related more closely to metastable solutions, the behaviour of supersaturated solutions to electrolytes does not appear to have been studied up to the present. Recent experiments on banded precipitates in gels appear to indicate that supersaturated solutions may be sensitive to electrolytes like sols.

Bechhold had previously mixed solutions of silver nitrate and ammonium chromate in the presence of varying amounts of ammonium nitrate and found that, with increasing ammonium nitrate the precipitate of silver chromate gradually decreased, disappeared, and then gradually increased again. A similar effect was found with potassium sulphate instead of ammonium nitrate. The experiments indicate both a change in the actual solubility of silver chromate and in the metastable limit, since concentrations could be found at which a precipitate was produced only after standing. With citric acid, as a trivalent union, there was an enormous increase in the value of the conic product; at which precipitation of silver chromate occurred, which varied with the amount of citric acid. When the metastable limit was reached a large excess of chromate was deposited. Experiments in gels indicated a similar effect in the case of potassium citrate and soluble phosphates. The experiments are being continued.

Supersaturated Solutions.

If this be so, suspensorial sols would correspond more clearly to metastable solutions and the emulsoid sols to true solutions. Indeed, the characteristic properties of colloid solutions may be due to one or both of two causes: supersaturation and particle size. From this point of view there should be substances which exhibit colloid properties merely on account of the large size of their molecules. There sols would be comparatively little affected by electrolytes and might be treated as an extreme case of ordinary solutions.

Almost all the phenomena of gelation indicate a connection with the process of crystallisation. The properties of supersaturated solutions have frequently been observed in the case of both suspensoids and emulsoids. Gold separates spontaneously from sols of more than a certain concentration, and the precipitation is hastened by the addition of a few drops of a second solution of colloid gold. Gelatin gelates more quickly if solid gelatin be added. Rubber emulsions behave in the same way. The variation of the gelation temperature with concentration strongly suggests crystallisation. And this is supported by the temperature increase in the concentration of solid remaining dissolved in the mother liquor expressed from gels. The crystallisation theory removes the difficulty of explaining the viscosity changes in emulsoid sols in accordance with Einstein's formula, since the changes are due to variation in the number of particles as well as their size. The onnotic pressure changes must be due to the same cause. Moreover, there are numerous organic substances known which behave exactly as indicated by von Weimann's formula, and can be obtained as desired in the ordinary crystalline or in the gel form. The sodium salt of acrylic acid crystallises from dilute solution as lenticular needles, while the boiling saturated solution sets to a "structureless" jelly. Examples could be multiplied indefinitely. Except, therefore that they are not readily obtained in the crystalline form, there seems to be no reason for supposing that gelatin and agar are exceptions to the rule. It is to be expected that, by suitable modification of von Weimann's factors, as, for instance, by reduction in the value of P, it should be possible to obtain the ultimate particles of gelatin of a microscopic size. Although the experiments are still in a preliminary stage the results strongly confirm the theory.

There is good reason for regarding the reversible sol-gel transformation as an extreme case of crystallisation, due to the very small diffusuity and consequent minimum velocity of crystallisation of the gel substance, which, with falling

solubility on cooling, necessitates the accumulation of an enormous excess concentration with great increase of viscosity, and gives a maximum value of N in von Weimann's formula corresponding to the gel state. This view is compatible with all the known properties of gels, as well as indicating new facts.

Considerations (mentioned in detail in the paper) suggest a structure for gelatin gels comparable to a pile of shot, but they leave open the question as to whether the spherites are themselves united into a framework. The problem is complicated by the fact that the skins of gelatin gels show elastic properties greater than those exhibited by the internal jelly. The formation of the skin is probably due to further precipitation at the surface, due to adsorption and evaporation, so that the spherites become felted and cemented together. It seems unlikely, therefore, that a gel which had been dried throughout, as in the case of ordinary sheet gelatin, would return to its original state by soaking in water. Consequently it is desirable to use freshly prepared gels in experimental work. Almost all the experimental results quoted in favour of a network within the gel could be explained by the presence of the skin, as, for instance, the gradual squeezing out of liquid from a swollen gel. Moreover, certain facts appear to indicate that the particles in the interior of the gel are not always united, or are at least easily separated. A gelatin cylinder, hung up by one end in a moist atmosphere, tends to become pear-shaped. Gelatin gels contract in the direction of greatest length when moderately heated, owing to the expansion of the gel within its skin. A gelatin cylinder diminishes in breaking stress on cutting the skin. Three cylinders of 5 per cent. gelatin 24 hours' old showed breaking stresses $\frac{(\text{gram})}{(\text{cm.}^2)}$ of respectively 16·9, 25 and 25 for the interior gel, and 33, 66, and 133 for the skin, giving a ratio varying from 2·1 to 5·3. On the other hand, aggregation must be assured in the case of the skin, and insufficient concentration is the only reason why the particles should not grow together within the gel.

The Structure of Gels

By J. G. Wakelin Barratt, M.D., D.Sc.

The current view of the constitution of gels, Dr. Barratt stated, is that of fluid droplets of extremely minute dimensions enclosed in a solid framework comparable to a honeycomb. The idea of this type seems to have had its origin in a suggestion of similarity of gel structure with that of the stems of young plants, which though containing, perhaps, as much as 90 per cent. of water, for the most part enclosed in cells, nevertheless possess considerable rigidity and elasticity.

It has been doubted whether gel characters are explicable as the result of fibril formation. This doubt seems to have arisen from the circumstance that, under suitable conditions of experiment, gels in which no fibrillary structure is apparent may be prepared from fibrinogen hydrosol. In my experimental work, however, it has been found that fibrils may be shown to be already formed for a relatively considerable time before becoming visible, being at first amicroscopic and subsequently increasing in size until ultra-microscopic visibility is reached. Moreover, the excessively fine fibrils first seen may, under appropriate experimental conditions, be made to increase in thickness until a diameter exceeding 1μ has been reached, this increase occurring at the expense of the continuous phase of the fibrinogen sol. It would appear, therefore, that the real structure of these gels is a fibrillary network, at first amicroscopic and later becoming ultramicroscopic. This type of structure affords an explanation of the physical characters presented by gels. If the fibrils are excessively fine and extremely numerous, a gel will be formed which, owing to the enormous resistance offered to the passage of water through the interstices of its fibrils, will appear "dry" and rigid, rather than elastic; if the fibrils are coarse and relatively few in number the gel will be moist, fluid will exude on pressure or on spontaneous "retraction of the clot," and a certain amount of elasticity will be observable. The network character of gel structure renders the behaviour of gels in respect of diffusion readily comprehensible. The fibrillary hypothesis of gel structure also affords a very simple explanation of gel filtration; ultramicroscopic and amicroscopic particles and also, under suitable conditions of experiment, large molecules or radicals may be arrested by gel fibrils in just the same way that microscopic particles are stopped by cotton fibres in filtration through filter paper.

Dr. STEPHENS said that rubber gels obtained by vulcanising rubber in solution of benzine had all the properties of rubber gels and were to be preferred to gels in aqueous solutions.

Professor PROCTER said he did not disagree with Mr. Hatschek's views. Whatever view was taken of a gel, it certainly had the properties both of a solid and of a solution.

Dr. MCBAIN referred to some work in this connection which has been carried out in the Bristol University Laboratory which was recently submitted to the Chemical Society for publication. In the case of soap solutions, it was found that the sol and the gel were identical except as regards mechanical properties, such as rigidity and elasticity, and that showed that we were dealing with the same chemical equilibria and the same chemical constituents in the sol as in the gel.

Dr. STEPHENS said he had been working with vulcanised rubber sols and gels and some of them showed very peculiar properties under the action of light. If exposed to diffused light for a few hours a sol became a gel, whilst if put back into the dark for a day or two, it became a sol again.

Glass and Pyrosols

Sir HERBERT JACKSON, who opened a discussion on this subject, said he did not see any relation between glass and colloids. Generally glass was considered to be of a crystalline nature, but the evidence of that was by no means conclusive. He was hopeful, however, that that matter would be taken up shortly. He dealt at some length with some of the characteristics of glass and the solutions or suspensions of colouring matter and concluded by saying that if further investigation showed conclusively that glass was crystalline, it would be a matter of considerable interest to colloidal chemistry.

Dr. TRAVERS was the only other speaker in this discussion, and the point of his comment was that when more was known about gels, then glass could be studied more effectively from the point of view of colloidal chemistry.

Nitrocellulose

By Sir R. Robertson, K.B.E., F.R.S.

The principal applications of nitrocellulose in industry, Sir R. Robertson said, are to celluloid, propellants, artificial silk, collodion and some blasting explosives. Most of the modern propellants are colloidal in character, and it is to the nitrocellulose which they contain that this character is to be attributed. As they have no definite crystalline structure, and can be obtained as uniform non-porous masses by the process of incorporation or malaxation during manufacture, they present an unbroken surface to the flame which ignites them, and even under pressure continue to burn regularly from layer to layer. It is this property that has enabled guns to be designed much lighter in weight than for gunpowder, and that has made it possible by suitable choice of thickness of the propellant to secure very high velocities of projectiles (within a narrow margin of a few feet per second from round to round) without undue strain on the gun.

To obtain the degree of regularity in ballistics necessary for accurate shooting it is important for the dimensions of the finished propellant to be within very narrow limits. It has been found that the nature of the nitrocellulose used affects the amount of shrinkage which takes place in the cord after squirting from the die, and it is obvious therefore that the colloidal properties of nitrocellulose gelatinised by means of solvents, either volatile or non-volatile, are of great importance in the study of propellants.

In general, those treatments which would be expected to effect disruption of molecular aggregates (*e.g.*, by grinding or chemical decomposition such as hydrolysis) are found to lower the viscosity both of cellulose and nitrocellulose solutions.

The work carried out has afforded a great deal of information on the nature of the solution of cellulose and of nitrocellulose and forms the basis for theoretical speculation apart from the bearing it has had on manufacture.

The viscosity of the solutions has been proved to have a direct relation to the properties of the dried colloid from which the solvents have been eliminated by drying. The dried col-

loid, however, presents difficulties in assessing its physical properties. One method of determining its toughness has been mentioned, and determinations of hardness by the Brinell method of breaking strain, or of resistance to crushing have been applied, but not so far with much that is informative. One method may be mentioned by means of which variations in the viscosity of the hard colloid may be traced. If large cords be pressed from different composition of the cordite type in which the proportion of guncotton to nitroglycerine is varied, these cords retain a small proportion of the volatile solvent. If now the quantity of this solvent be determined in different concentric zones it is found that as the nitrocellulose becomes dominant, a proportion is reached when the distribution of the volatile matter is no longer uniform, but increases regularly from skin to core, the ratio of the content of volatile matter in the different regions remaining constant although the total quantity is reduced in the process of drying. This resistance to the migration of the solvent is some measure of the viscosity of the horny substance, and its regional determination might, perhaps, assist in the investigation of the physical condition of other hard colloids.

Nonaqueous Colloid Systems with Special Reference to Nitrocellulose

By F. Sproxton, B.Sc., F.I.C.

Nearly all nitrocellulose solvents contain the carbonyl group—CO—in the form of a ketone, ester, or acetyl group. There are, however, some exceptions, and ether-alcohol is one of considerable importance, particularly in view of its extensive use during the war in cordite manufacture. Baker investigated the viscosity of ether-alcohol mixtures and concluded that dissociation of (associated) alcohols takes place in such mixtures, but is accompanied by the formation of an ether-alcohol complex, to which the solubility of nitrocellulose is due. Quite recently, Gibson and McCall have investigated the effect of variations in the proportions of ether and alcohol on the viscosity of ether-alcohol solutions of nitrocellulose. They find that "the optimum solvent for a nitrocellulose depends on its nitrogen content, and that the higher the nitrogen content, the more ether the optimum solvent requires." This method of expressing the result is, perhaps, open to criticism. The composition of the optimum solvent may vary with the nitrogen content, but it may be directly governed by some other factor which usually varies at the same time as the nitrogen content—for instance, the percentage of free hydroxyl groups in the nitrocellulose. Not all of the hydroxyl groups of cellulose are esterified in nitrocellulose, and dry nitrocellulose absorbs moisture from a damp atmosphere. It has been shown by Renker that cellulose dried by alcohol retains traces of alcohol even when dried at 130°C. It is not impossible, therefore, that the free hydroxyl groups in nitrocellulose attract alcohol molecules which would otherwise take part in the formation of the solvent complex, and the variations in the composition of the optimum ether-alcohol solvent for various nitrocelluloses may be due to the differences in the percentage of hydroxyl groups which the nitrocelluloses contain.

The solvent power for cellulose esters can be studied by the following methods: (1) The viscosity determinations, the assumption being that that solvent is the best which gives solutions of lowest viscosity; (2) determination of transition temperature, *i.e.*, the temperature at which a liquid or mixture of liquids becomes a solvent; (3) determination of the amount of an indifferent diluent which may be added to a solution before precipitation takes place; (4) determination of the amount dissolved from a sample of cellulose ester of incomplete solubility.

It would be premature to say whether these four methods all lead to the same result, but I have not found any contradictory results up to the present.

The colloid chemistry of the manufacture of solid celluloid is complicated and difficult. Contrary to a somewhat widespread belief, at no stage of the manufacture do we deal with a sol, if we except a momentary formation at the surface of the fibrous nitrocellulose when the liquid solvent first comes into contact with it. The amount of liquid solvent employed is less than the nitrocellulose would take up in its preliminary swelling if soaked in the solvent, and since the product of preliminary swelling is a gel, it follows that the whole of the manufacture of solid celluloid from nitrocellulose deals with the gradual transformation of a gel to a solid. This transformation is accomplished by loss of solvent, which involves loss in weight and in volume, while undoubtedly the mechanical properties of the finished material are influenced also by the amount and character of the manipulation it receives in the plastic state.

Viscosity of Cellulose Acetate Solutions

By Dr. Guy Barr and L. L. Bercumshaw.

In this paper experiments were described which were made to investigate the changes in viscosity and density of cellulose acetate solutions in acetone on the addition of varying quantities of water, alcohol and benzene.

In the manufacture of non-inflammable dopes used for tautening the fabric on the wings of aeroplanes, the viscosity of the solution of cellulose acetate in the dope solvent not only limits the concentration which it is possible conveniently to employ, but also necessitates the use of an acetate which does not possess the maximum viscosity in acetone solution, *i.e.*, which is more "degraded" and has less film strength than the best acetate that can be manufactured.

It has long been known that the solubility of cellulose acetate in acetone and the viscosity of the solutions is modified considerably by small quantities of water; but accurate determinations of the extent of this influence have been, up to now, lacking. It was, therefore, thought advisable to study the viscosity concentration (*i.e.*, concentration of water) curve for a 5 per cent. solution of a typical acetate in pure acetone up to the point of precipitation of the acetate. Very interesting results were obtained and it was decided to investigate the influence of benzene and ethyl alcohol (other liquids used in the manufacture of dope) in a similar manner.

Action of Light on Rubber

Mr. B. D. PORRITT, speaking on the action of light on rubber, said that it had been found that oxygen played an important part as a catalyst. Rubber changed under the action of light in two ways, first in the form of tackiness and secondly into a brittle substance. In the dark there was no change whatever. The effect of light on the viscosity was also considerable and although it might be assumed that a rubber of low viscosity would be more prone to oxidation than one of high viscosity, that was not so, as manufacturing methods had been evolved which counteracted the effect of low viscosity.

Dr. STEPHENS pointed out that tackiness occurred with raw rubber and brittleness with vulcanized rubber.

Precipitation of Disperse Systems

Owing to the lateness of the hour the discussions on "Precipitation of Disperse Systems" and "Cataphoresis and Electro-Endosmose" were taken together. Dr. A. W. Porter briefly introduced the subject and was followed by papers by J. N. Mukherjee and Dr. Ormandy.

Mr. MUKHERJEE, in his paper on "The Origin of the Charge of a Colloidal Particle and its Neutralisation by Electrolytes," summarised the conclusions as follows:—

The charge of a number of suspensoids has been traced to the adsorption of a common ion. The nature of the chemical forces to which this adsorption is due has been defined. The effect of the electrical charge of a surface (due to the adsorption of ions) on "ions" of opposite sign has been theoretically investigated for the case when chemical action does not take place between the surface and the "ion." The "electrical" forces are sufficiently strong to account for adsorption. The stability of the adsorption of an ion of opposite sign by electrical forces has been given a quantitative form assuming that the charge of the surface consists of "ions" which can be treated as "point" charges widely separated from each other. Actual calculations justify this assumption. The following series of the order of adsorbability of cations by a negatively charged surface has been deduced from the theory

$$Th > Al > Ba > Sr > Ca > Mg > H > Cs > Rb > kN > a > Li.$$

This is the order of the precipitating power of these ions for a number of suspensoids of widely different chemical proper-

ties. Equations deduced from the theory satisfactorily agree with the experimental observations of Elissafoff on electro-endosmose. The chemical affinity of the surface atoms is not always negligible. For this reason the series given above cannot be expected to hold in all cases.

Practical Application of Electro Endosmose and Cataphoresis

By Dr. W. R. Ormandy

In this paper Dr. ORMANDY stated that the number of industries which had arisen out of the deliberate application of the theoretical laws relating to electro endosmose and cataphoresis were comparatively few and there was not much progress to record since the issue of the second report on colloid chemistry which appeared in 1918. The work, which had issued from the laboratory of the Elektro Osmose Akti-engesellschaft, still remained the largest contribution to this class of work. Undoubtedly the Schwerin patents applied to the purification of clay formed one of the most interesting practical adaptations of the complicated physical laws dealing with colloids. It had been stated that the electro osmotic process did not bring about any purification of the clay material in the actual osmose machine, but, whatever might be the position theoretically, the fact remained that in practice such a purification was brought about, as had been proved beyond all doubt at the laboratory of the Osmosis Company, Ltd., by Mr. Lawrie, when working on tons of china clays and ball clays.

The application of the electro-osmose filter press to colloidal peat suspensions resulted in the removal of large quantities of water at a comparatively low cost in fuel; thus hydraulically mined peat, containing only five parts of dry peat substance in 100 parts of suspension, resulted in the removal of 85 parts of water from the 100 parts of mixture, with an expenditure of current which could be produced by the consumption of one-sixth of the resultant fuel. Unfortunately peat was generally found in comparatively thin layers, and owing to the small percentage of dry substance contained in the peat, the osmose plant would soon be far distant from the point where the fuel was being worked. It was obvious that the process lent itself particularly to application in countries where water-power was available for producing the necessary electricity.

By passing an electric current through silicate of soda solutions it was possible to drive out the soda and leave the silicic acid behind, but this could only take place if diaphragms are employed which would permit of the soda ions passing out of the silicate of soda solution and would not permit of backward way diffusion into the inner chamber. Years of experiments had resulted in the development of such diaphragms, and it was now possible to produce silica solutions up to 30 per cent. in strength, but the stability of these solutions diminished as the concentration increases. The stability of these silica solutions had been found to increase with each step in progress which had been made, resulting in the more complete removal of the sodium salts. These silicic acid solutions of 5/10 per cent. strength had been largely used on the Continent for therapeutical purposes, and the strong solutions after polymerisation resulted in the formation of a gel, which, on drying, produced an inert highly electro-negative finely divided colloidal gel, which had proved to have extraordinary properties as an adsorbent for use on wounds.

A very great simplification had taken place in the plant now used for electric tannage of skins. Two factories in Germany were at present employing the process, and the chief claim made was that it permitted of the utilisation of very dilute tanning liquors, with complete utilisation of the tanning material. It was further claimed that experiments had shown that it was preferable to complete the tanning for two or three days in the ordinary way in strong liquors, and that the current consumption was thereby reduced from 20-25 kw.-hrs. per square metre of hide when complete electrical tanning was employed; to 6 or 7 kw.-hrs. per square metre when finishing in strong liquors was employed. Here, again, progress had resulted entirely from the discovery of suitable membranes for the enclosing of the anode and cathode.

It had been found that if a finely ground ore be suspended in water, in many cases it was possible to add traces of electrolyte which were selectively adsorbed. If such finely ground ore be allowed to fall through a column of water to which has been added the necessary quantity of suitable electrolyte, and if a current be passed through the water at right angles to the path of the falling particles, the charged particles were drawn on one side and fall into separate receptacles, bringing about concentration of the ore. Iron ores occurring in clay deposits had been concentrated by the removal of the clay substance on the lines above described.

By the use of diaphragms very similar to those employed for the separation of the constituents in serum, it had proved possible to prepare exceedingly pure gelatines from low grade gelatine, and even from glue. These gelatines were so pure that a 5 per cent. solution might be kept for weeks or months without any bacterial growth occurring therein, owing to the fact that the whole of the food material which was necessary for bacterial growth had been so entirely removed. Such gelatine was being prepared in this country and was being tested for photographic and other purposes.

The electrical methods employed for the removal of oil from watery emulsions were really an application of cataphoresis. The oil globules were charged by adsorption of the inorganic salts present in traces and passed to the anode. It was well known that many tars produced by distillation and many natural paraffin oils contained water in a state of emulsion which was very difficult to separate. Just as the application of direct current electricity had for some time been employed for the separation of oil emulsions from water, so similar electrical methods were used for the removal of the water particles forming the disperse phase in oil as a continuous phase. This application was very largely used in the Californian oilfields.

The Conference concluded at 10.45, and contributions in writing to any of the discussions were invited.

Income Tax, 1920-21

To the Editor of THE CHEMICAL AGE

SIR,—Doubtless your readers are fully conscious of the daily issue of the notices of assessment for the current year. The particulars of these notices require very careful scrutiny, not only to ensure that the amount of assessment is correctly arrived at and stated, but also to verify that the necessary deductions, allowances and reliefs have been given for expenses, earned income tenth, personal allowance of £135, marriage allowance £225, housekeeper £45, widowed mother, &c., £45, first child £36 and each additional £27, dependent relatives £25, life insurance premiums, and 3s. per £1 on the first £225 of taxable income.

In many cases it would appear that the Revenue Authorities have not granted the deductions, &c., which are claimable, possibly owing to the fact that returns were made on the old basis of liability and the work of assessing had to be advanced and completed before it was possible to ascertain precisely what deductions, &c., were allowable. Particularly is this true of individuals who before the present year could not claim on account of having incomes over the limit for deductions, &c.; now all taxpayers may claim irrespective of the amount of total income.

It must be remembered that appeals against the assessment are to be given within twenty-one days, so that taxpayers should lose no time in giving notice of any objection they have to the whole or any part of the assessment.—Yours, &c.,

W. R. FAIRBROTHER.

67-68, Cheapside, London, E.C.2.

Geological reports testify that the new oilfield near Fort Norman, Canada, is one of the richest ever discovered. The president of the Imperial Oil Co. says the well is 1,500 miles north of Edmonton, and 1,200 miles from the nearest railway station. For that reason it may be years before supply in any quantity reaches the market from this source. The only access is by floats of 4-to 5-foot draughts on the river to the nearest point for river boats 900 miles away. Such a course would necessitate unloading and reloading several times on account of rapids.

Filter Presses: Their Construction and Use

By Mr. EUSTACE A. ALLIOTT, B.Sc. (Eng.), A.M.I.Mech.E.

A LECTURE on "Filter Presses (Chamber and Frame types): Their Construction and Use," was given by Mr. Eustace A. Alliott, B.Sc. (Eng.), A.M.I.Mech.E. (Messrs. Manlove, Alliott & Co., Ltd.), on Thursday, October 21, at the Manchester College of Technology to a large audience. The object of the lecture was to make clear the construction and meaning of the numerous variations of type. A special effort had been made by Mr. Alliott to obtain up-to-date particulars which applied to every-day large scale operations.

Owing to the familiarity of the filter-press, he said, it did not usually receive the attention which it deserved, and which probably would be accorded to it, if it were a new piece of apparatus, or if the simplicity of its operation were less obvious. A filter-press might be described as a frame in which a number of loose slabs of filter surface could be clamped to form a series of hollow chambers capable of withstanding internal pressure, the filter surface being ribbed or grooved and covered with cloth. This arrangement gave a maximum of area in a minimum of space, and was capable of modification to meet the varying conditions called for by different grades of material, as regards thickness of cake, suitable pressure, varying filter media, and arrangements for washing and steaming the cake when formed. A large variety of constructional material could be used, and the whole plant was of high reliability, and free from tendency to break down.

The Two Types in General Use

Describing the construction of the two forms of press in general use, namely, the recessed plate type and the plate and frame type, which were often referred to as "chamber" presses and "frame" presses respectively, he said that in the former type the rims were raised, so that when two plates were brought together edge to edge a hollow chamber was formed between them. The feed passage was taken through the body of the plate, while the filter cloths were laid over each side of the plate, thus forming a pressure-tight joint at the rims when clamped up, and having holes for the feed passage, which were sewn together, or clipped, to make a joint at the corresponding hole in the plate. This type of plate possessed the merit of being the least expensive and requiring less labour. It was very suitable for thin cakes owing to the free communication of the feed passage with the chambers. The usual cake thicknesses were 1 in. on the smaller sizes, 1½ in. on the intermediate and large, and up to 2 in. on the largest plates.

Generally speaking, it was not desirable to use recessed plates for thicker cakes than these, on account of the strain on the cloth imposed by the raised rim. The liquor entered the chamber under pressure, the solid portions being retained by the cloth, while the fluid portions passed through and drained behind the cloths through the grooves or corrugations to the exit ports. They passed finally into the filtrate trough by simple spouts if rough filtration only was required, but more usually taps were fitted by means of which any one chamber could be isolated if the filtrate from it was muddy, due to faulty cloth. Taps were also needed for certain arrangements of washing presses. Where a liquor must not come in contact with air, or if it was desired to raise it to a higher level direct from the press, it could be taken away by an enclosed outlet passage. Recessed plates usually had a central feed. It was sometimes preferred in the top corner in cases where the cake was apt to be slimy round the feed passage.

By this arrangement the moist portion of the cake was readily isolated from the bulk, which was firmer and drier. Putting the passage in a corner in this manner, however, tended to cause more strain on the cloth in a recessed type press. Bottom feed was useful if a solid cake was not to be formed, as the liquid contents of the cells could be run out before opening the press, but when the solids had a strong tendency to settle it might become choked, especially if the flow was slow. When heavy suspensions were being dealt with, top feed was therefore valuable. In cases of this kind two feed passages were sometimes arranged at different heights, so as to get the maximum consolidation of cake. The path of each particle was determined by definite stream lines, in conjunction with its own tendency to sink or float. Thus, with bottom feed, no large heavy particles might reach the top of the plates unless the stream line flow was strong. There was no agitation worth speaking of in the press itself, as the small amount which might occur near each inlet port was quite powerless to cause redistribution if selective settling had been allowed to occur.

The Plate and Frame Type

The plate and frame type of press was suitable where very thick cakes were to be formed, as the plates themselves were flat, and the chamber was formed by hollow frames being placed between them. This type of press was also suitable for materials which tended to rot the cloths, as the latter lay quite flat on the plate, and it was a necessity if filter paper was to be employed. It must be used where very thick plates were essential, but was not suitable for thin ones or materials of a lumpy or uneven nature, as the feed ports were generally taken in through the rim of the frames, and were thus restricted in area. On a small press frames as thin as ½ in. could be used if the feed was of a more or less liquid nature throughout the operation; ⅞ in. or 1 in. frames were usually quite thin enough, and where chambers exceeded 36 in. square it was preferable that these should be thicker if possible. When handling very free filtering materials, having a tendency to deposit a very hard, thick cake, it was sometimes desirable to use an internal feed. Passages arranged externally to the cake were highly satisfactory for less freely filtering substances, as they isolated the moist unfiltered liquor from the drier cake. Further, the feed holes in the cloths were clipped automatically by the joint surface of the plates and frames, and so needed no sewing or special clips.

The usual position for the passage was at the top centre of the press, which allowed little opportunity for displacement of the feed holes in the cloths either by accident or shrinkage. Another position in general use was in the side of the press at a little above or somewhat below the centre. Such a passage was not so liable to get blocked by settlement as one in the bottom of the press, and was in a favourable position for consolidating the cake. For varnishes and gummy liquors which flowed with difficulty these presses were sometimes made with four passages, one at each corner of the chamber; one of the lower passages serving as a feed inlet and drain, while the other three acted as filtrate outlets, being joined together at the head of the press.

By this arrangement the liquor had a minimum distance to travel through the grooved surface to get to the outlet passage. Further, the upper passages ensured a free escape of the air from the chamber, whereas it might otherwise have difficulty in passing through the joints when these were under heavy pressure and the cloths heavily gummed up. Presses were sometimes provided with special air passages or taps for this purpose, but except for washing presses it was rarely that these were necessary.

Press Plates

Press plates were usually made in cast iron for neutral or alkaline materials, or in wood for acid liquors, or for dealing with such materials as colours, which might be spoilt by contact with iron. They could also be made of bronze or aluminium, or covered with hard lead or vulcanite. Vulcanite was generally supported by thin steel sheets, and the joint surfaces were made of softer rubber. Such a press was suitable for dealing with stong hydrochloric acid.

Types of Filter Surface

Discussing in detail the various types of filter surface, ranging from very fine straight curves to comparatively coarse pyramids or lozenges, Mr. Alliott stated that the first and most important point was that the channels should be sufficiently deep and narrow so as not to be closed by the sag of the cloth. Secondly, the cloth must be adequately supported with a minimum amount of dead space, though, provided the channels were free, the percentage of dead space within reasonable limits appeared to make no appreciable difference in practice. Thirdly, smoothness and absence of sharp corners was a factor of no little importance. Covering the surface with perforated plates was only to be recommended in special cases where the adequate support of the cloth had to take precedence over every other consideration. Any such covering

added to the work of keeping the filter surface clean. For very viscous liquors the supporting of the cloth might have to give way to the necessity for providing very free flow at the back of the cloth, there being consequently wider gaps between the supports.

In the case of large presses, over 36 in. square, where there was very high pressure or probability of uneven filling of the chambers, it was necessary to provide the surfaces of the plates with bosses to act as additional supports. Considerable care must be exercised in designing the handles, as there should be ample room to get the hand in easily without trapping or fouling. In the case of heavy plate rollers were usually fitted, and occasionally a special carriage was arranged upon which the plates could be run along the press. For feeding the press and for washing purposes cocks were better than the ordinary type of valve, and a "dead plate" or "cutting-off plate" was desirable if batches of varying size were to be dealt with. The question of side rods had received some attention from makers.

The gear was next described for the working of different types of presses, including the centre-screw pattern, the rack and pinion, the spur wheel and pinion, and hydraulic pumps, cake trays, and the methods of dealing with strong caustic liquors, and with the choice and care of filter cloths. He also exhibited screen illustrations of various precipitates. The respective merits of cotton, linen, jute or hessian, asbestos and wire cloths were then dealt with.

Design and Efficient Working

The design and efficient working of a filter press installation depended upon the material, the treatment required, and various factors of a mechanical nature in respect to all of which Mr. Alliott gave a detailed explanation. A number of curves were also shown indicating the economic factors in the working of filter presses. Feed and washing methods were also explained.

Labour costs were dependent upon the press itself, the general arrangement of the plant, the grade of material and local conditions. Generally speaking, medium sized plates were the most economical from a practical point of view. There was usually no great saving of labour or increase of output in the case of long presses. Cake trays were distinctly labour economisers, but it was better where practicable to have the presses on an upper floor and discharge through shoots into trucks. A useful alternative was to have the tray or floor made sloping, so that the discharged material could be easily raked down into a suitable receptacle, and a good arrangement was to have the mixers, autoclaves or dryers which dealt with the next operation so grouped with the presses that the discharged cake could be shovelled in direct. Pumps and sludge rams were best worked from the same platform as the filter presses, and the mixers which delivered the liquor to them should also be within easy access. Most of the work depended, however, on the material itself and the proper building of the cake. If the cake broke up readily and dropped clearly away from the cloth, the labour would be only perhaps one-half of what was necessary if the cake was half-formed and sloppy as then the whole cloth face must be thoroughly scraped. Low labour costs also depended upon the proper choice of a cloth and the adaptation to filtration of the chemical and physical qualities of the material.

The best success of a filter-press installation depended also not only on the choice of plant, but more especially on those in charge of the operations. It was nearly always possible to reduce high labour and cloth charges by proper methods in the lay-out of the plant, and especially in the formation of the precipitate or suspension.

A joint meeting of the Faraday Society and the Sheffield Section of the Institute of Metals will be held in the Mappin Hall of the Department of Applied Science of the University of Sheffield, St. George's Square, on November 19th, to discuss papers dealing with various aspects of electroplating. Communications are promised from representatives of the scientific side of the electroplating industry in London, Birmingham and Sheffield. Those desirous of taking part are invited to communicate with Dr. F. C. Thompson, Department of Applied Science, University of Sheffield.

Death of Mr. Leonard P. Wilson

THE Birmingham & Midland Section of the Society of Chemical Industry has sustained a severe loss in the sudden death early last week, following an operation for appendicitis, of Mr. J. P. Wilson, the Chairman of the Section, and a Vice-President of the parent Society. Mr. Wilson was the chief research chemist at Messrs. Courtaulds, Ltd., Coventry, and he had for several years past taken a deep and active interest in the doings of the Society. He was a recognised authority on scientific questions relating to artificial silk, and he had consented to give a paper at the meeting of the Midland Section on October 21. This paper he had prepared in collaboration with his colleague, Miss Imison, and at the meeting next month she will read the paper.

The funeral of Mr. Wilson took place at Coventry on October 20, and the section was represented by Dr. Twiss, chief chemist, Dunlop Rubber Company, and the parent Society by Mr. H. Silvester. Fitting reference was made at the opening meeting of the section, which was held at the University of Birmingham on October 21, by Dr. Browasdon, the senior vice-chairman, who presided, and who succeeds to the chair. He paid a high compliment to the public spirit of Mr. Wilson, to his high qualities as a research chemist, and to his geniality and kindly spirit. No man was more popular or more widely respected. A resolution of sympathy with the relatives, the members rising in their places. Mr. O'Shaughnessy, the hon. secretary, stated that it was hoped to have five or six meetings during the winter session.

Dr. Murray, head of the Wolverhampton Technical School, read an interesting paper on "the Structure of the Atom" with special reference to chemistry.

Patent Case

IMPORTANT questions were raised in the Appeal Court on the right of a patentee to apply for extension of time of a patent and the time when he was entitled to make such application under the Patents and Designs Act, 1919, section 7, amending section 18 of the Act of 1907, and on his rights of appeal. The appeal was in regard to Davidson's patent, and from a decision of Mr. Justice Sargant. Application was made by originating summons, and it asked for the extension of eight patents granted from 1911 to 1915 inclusive, on the ground of loss or damage caused by war. Mr. Justice Sargant held that section 7 of the Act of 1919 had not made any alteration in the existing practice by which extensions should be applied for shortly before the six months prior to the expiration of the patents, and he dismissed the application on the ground that the extensions had been applied for at much too early a date. The patentee appealed, but judgment delivered was to the effect that there was no appeal in the case. Therefore, the appeal failed, as no appeal lay. The Master of the Rolls said that he regretted the decision to which he felt bound to come. A decision that the summons was premature was certainly a judgment, and it was clear that any decision of a Judge in a patent case except in the case of an order revoking or confirming the revocation of a patent was not subject to any appeal.

Recent Wills

Mr. W. B. Cowie, 8, East Claremont Street, Edinburgh, pharmaceutical and manufacturing chemist..... £5,400

Colonel C. E. Dudley, Fairhazel Gardens, Hampstead, Managing Director of the Anglo-American Oil Co., Ltd.; director of The Dublin Oil Co., Ltd..... £9,153

Mr. J. O. Fison, of Sutton, Suffolk, Manufacturing Chemist £115,298

Mr. G. H. Morgan, of Wem and Whitchurch, Chemist £43,113

Mr. W. Aldridge, Fitzwarren Gardens, Highgate, Oilman..... £4,837

Mr. W. B. Cowie, 8, East Claremont Street, Edinburgh, pharmaceutical and manufacturing chemist..... £5,400

Colonel C. E. Dudley, Fairhazel Gardens, Hampstead, Managing Director of the Anglo-American Oil Co., Ltd.; director of The Dublin Oil Co., Ltd..... £9,153

British Association of Chemists

Annual Report for the Year

IN the Council's annual report for the year ended September 30 last, to be presented to the annual meeting in Manchester to-day (Saturday), it is stated that registration under the Trade Union Acts, 1871-1917 was effected on August 20 last, and the Association is now a legally constituted trade union. The Council believe that the preliminary work has been accompanied by a growing appreciation of the market value of the chemist, and that chemists themselves are beginning to realise the economic value of a strong professional organisation. This step has been taken to give the Association a sound legal position and so enable it to pursue without let or hindrance the policy of conserving and advancing the economic interests of all properly qualified chemists, without distinction of class, and it in no way connotes any adhesion to the particular lines of action with which the term "trade union" is commonly but improperly associated.

The total membership is now 1,153, as compared with 759 at the beginning of the year. The increase is largely due to a definite publicity campaign which has been carried on with the object of making the aims of the Association more widely and generally known to chemists. As a result a growing interest has been noted in the affairs of the Association, and a considerable correspondence has been maintained in dealing with queries and difficulties which have arisen. New sections have been formed at Glasgow and Falkirk during the year, and it is hoped in the near future to be able to organise a section in South Wales. Consuls have been appointed in the Stoke-on-Trent and Aberdeen districts.

Minimum Salary of £350

The Appointments Bureau is now definitely established and at work, under the control of a chief recorder in London and section recorders in each of the local sections, and it is hoped that employers of chemists will recognise the valuable services that it is able to render them, and that they will avail themselves freely of the facilities it offers. The chief difficulty at present is that of finding appointments for the higher salaried men, and it lies with the general body of chemists themselves by adhesion to the professional association charged with the care of their economic interests, to reduce this difficulty to a minimum.

It has been definitely decided during the year that the Association minimum salary standard for full members shall be £350 per annum. Any instances of obvious underpayment, even if above this minimum, will, however, also be investigated. Many cases of inadequate remuneration have been inquired into and action has been taken. In the majority of cases the Association has been sympathetically met by the employers, matters have been adjusted on reasonable lines, and considerable increases in salary have been secured. This work is being actively pursued, and members should not hesitate to bring any cases of unfair treatment before the Association.

A scheme has been elaborated whereby students and students' chemical societies at recognised educational institutions may become affiliated to the Association. It is hoped that all students will avail themselves of this facility during the coming session.

A Joint Committee on Income Tax was established during the year, consisting of representatives of the British Association of Chemists, the Institute of Chemistry, and the National Union of Scientific Workers, to consider the whole question of abatements from income tax on account of special charges. A memorandum was prepared and met with wide support amongst scientific and other bodies. This memorandum was forwarded to the Chancellor of the Exchequer, and is at present under consideration.

Defining the Chemist's Position

Legal advice has been given on questions concerning agreements between members and employers, and a number of cases have been amicably adjusted to the material benefit of the members concerned. The whole question of agreements in relation to patents, &c., has been the subject of special consideration, and some definite recommendations are before the Council at the present time.

It has constantly been felt that the misapprehension that exists in the minds of the public over the term "chemist" should be cleared up, by legal action if necessary. It was recognised that no definite steps could be taken until the Association was properly constituted. A committee has now been appointed to investigate thoroughly this and similar questions, and to suggest to the Council a specific line of action for securing the co-operation of the pharmaceutical and other scientific bodies with the object of defining the future legal position of the chemist and his profession.

The Whitley Councils Committee, in the pursuit of the Association's policy of securing independent representation on Whitley Councils for the professional man, has devoted considerable time and labour to secure federated action by professional, technical and scientific workers. The difficulties of concerted action have not been minimised by the emergence of the question of exercising class distinctions in the membership of professional associations, and the Council is not prepared to accept a policy that would exclude any duly qualified chemist from membership of the Association or from participation in its affairs. In pursuit of the Association's policy as regards Whitley Councils, a committee has been appointed to formulate bye-laws for the constitution within the Association of Guilds of members connected with specific trades, and to take steps for the establishment of Guilds in the dye-making and textile industries respectively.

The Council has during the last year availed itself of every opportunity of promoting union amongst chemists, so far as this can be accomplished without derogation of their professional status, and it believes that signs are not wanting that chemists are becoming increasingly willing to sink their differences and work together in the interests of the whole profession.

The prolonged and regretted absence through illness of Professor Hinchley has been greatly felt, and satisfaction is expressed that his health is now largely restored. The large amount of pioneering work performed in the past by the President cannot be too highly appreciated.

The report is signed on behalf of the Council by Dr. W. E. Kay, vice-president (*Chairman*); Mr. A. G. C. Paterson, hon. treasurer; and Mr. S. Reginald Price, general secretary.

German Nitrogen Products

IN a circular issued by Messrs. Thomas Aikman, jun., and dated October 22, considerable opposition is said to have been shown on the part of the German agriculturists, owing to the present financial conditions in their country, to take delivery of their fertiliser requirements before the spring, and, in consequence, a licence was granted by the German Government to the syndicate controlling the output of these products to export up to 25,000 tons of nitrogen during the next few months (roughly £125,000 tons in terms of sulphate of ammonia). Negotiations for the purchase of this by an important British and Dutch syndicate have been proceeding for some time, and, apart from some small quantities sold in Italy and Holland, the total quantity has now been acquired by them in the form of sulphate of ammonia, with the guarantee that no further quantities will be sold for export during the coming season. Labour conditions in Germany have improved, and some increase in production of nitrogen products is reported. There is considerable uncertainty as to future rate of production, and as to consumption in Germany. Until the consuming season approaches the present prohibition of import on this article is likely to be maintained.

Roumanian Petroleum

PETROLEUM developments are taking place in Rumania. The Ministry of Cmmerce and Industry has divided the territory into seven districts, which will be administered by an inspector of mines, who will have under his control other sub-inspectors for carrying out the work of the departments. Offices will be established at Bacau, Buzau, Ploesti, Petrosani, Cluj, Temisoara and Baia-Mare, the adjoining oil territories in the various districts being administered from the local headquarters. The formation of a company entitled "Construction Civile et Industrielle" for the purpose of carrying out all works necessary for the development of the petroleum industry is contemplated. The head office will be at Ploesti, and the company will have at its service the co-operation of the leading Rumanian mining and civil engineers.

Society of Chemical Industry

Opening of the Newcastle Session

THERE was a very large attendance at the opening meeting of the winter session in the Armstrong College on Wednesday week, when the new president of the section (Dr. J. H. Paterson) occupied the chair for the first time.

A vote of thanks was accorded Professor P. P. Bedson for his services as chairman during the past two years, and Dr. Bedson suitably replied. Professor A. L. Howarth, who has joined the staff of Armstrong College from St. Andrew's, was given a welcome to the section.

Publicity

A discussion took place on the policy of the Society with regard to the publication of the proceedings in trade papers and certain suggestions were forwarded to the Council of the Society.

In moving the adoption of the financial report in connection with the annual meeting held in Newcastle, Professor P. P. Bedson said he had pleasure in saying that there was a balance on the credit side, and he asked the members to pass a vote of thanks to Mr. H. Dunford Smith, secretary, Professor Garret and Mr. Trobridge for their work in organising the local arrangements for the annual meeting. This was cordially agreed to.

Dr. Paterson on "The Fuel Problem"

Dr. J. H. Paterson, in his presidential address on "The Fuel Problem," said that during the past year he had been doing a good deal of work for people using a great amount of coal in their industrial processes. He had been struck by the absolute lack of reliable published knowledge and data connected with the various methods of using fuel in an economic manner. It was extraordinary when one considered the large mass of literature published on fuel, how little of it took into account the very important financial side of the question. It was comparatively easy to get information on the finance of gas production and, in recent years, on fuel economy in blast furnace and steel work practice, but it was well nigh impossible to get satisfactory data regarding the fuel problem for other industries.

When taking about fuel he proposed to confine his remarks to coal as he could not see how any other fuel could be considered as a serious competitor in this country. He dealt with the attempts to make peat a commercial proposition and concluded that it was not feasible. The Ashington Coal Company had been bringing up 9,000 tons of coal per day in 1912. To deal with an equal amount of peat one would have to arrange for sufficient drainage to deal with the drying of the peat and that would necessitate a flow 50 ft. wide, 2 ft. deep, and 10 miles long, flowing daily year in and year out. There had been a great deal of controversy during the past few years regarding the best methods of converting coal into mechanical energy, and one of the proposals had received considerable attention, namely, the suggestion to erect a number of super-power stations. That proposal received a good receoption at first but it had been severely handled since. The controversy had, at least, served to show how little we really knew about the problem of fuel economy. In spite of the best experimental practice at present in generating electricity, only 20 per cent. energy came out at the turbine and no power station could keep that figure up continuously, especially when they had to rely on various qualities of coal.

Re-Heating Furnaces

Dr. Paterson devoted a considerable portion of his address to the question of re-heating furnaces, claiming that very little was known regarding the fuel economy problem in metallurgical work. There was one aspect of the problem which he believed would be the subject of considerable research in America, namely, the quality of the air in the furnaces. Few people appeared to realise in connection with either boilers or furnaces how much of the heat which the coal contained passed up the furnaces with the nitrogen contained in the air. Good practice required about 215 cubic ft. of air for 1 lb. of coal burned; in boilers it was fairly good practice if the figures were between 270 and 300 cubic ft. of air. They would easily see how an immediate saving could be obtained if in some way they could reduce the amount of air which was passed through the furnace to supply the necessary oxygen. If some method could be devised to reduce the amount of air required to burn 1 lb. of coal it was obviously a step towards fuel economy. One direction in which they might work to that end was to pay some attention to the quality of the coal burnt. It was a truism that the bigger the coal the more air it required, so it would appear that the finer the coal the less air it would take. He thought that there was a case for the burning of fine coal.

Use of Cheaper Oxygen,

Another method would be to remove the nitrogen from the air and use only oxygen. That method was being seriously considered and was considered many years ago in Germany and Italy. In dealing with the possible objection that the price of oxygen at present was prohibitive, he pointed out that if some method was devised of using oxygen in the way he had suggested there would be no occasion to use the oxygen prepared in the present expensive manner. It need not be oxygen hermetically sealed at high pressure but oxygen of a low pressure and, therefore, cheaper to produce. In Canada, such oxygen as he had in mind was being produced on a large scale at three cents. per 100,000 ft. While one could not, with the present limited knowledge of the subject, advocate the use of oxygen it certainly opened up a wide field for investigation.

Dr. Paterson said that he had always felt it a very sore point that Newcastle, being such an important place in regard to fuel, should have taken so little interest in the problem of fuel economy so far as published work was concerned. Whilst he recognised that a great deal of the necessary research work would be impossible except by big corporations or by subsidies, the fact remained that it badly needed doing. Newcastle was certainly one of the places where it should be done when they compared it with comparatively unimportant places like Leeds and London (laughter). One of the most important points in any such research was undoubtedly the study of the metallurgical furnace as a whole. If there was one important problem in fuel economy it was the problem of knowing definitely from published figures of guaranteed accuracy how fuel ought to be burnt in furnaces other than those beneath a boiler. There had been quite a lot of attention paid to the boiler, but practically none to other furnaces, and particularly in the direction of costs involved. The only solution was a correlation of data from manufacturers. He had not met manufacturers who were not amenable to reason, but he had met manufacturers who had no idea as to how their fuel was being burned. To have real fuel economy it would be absolutely necessary to prove to the careless user that he could save large sums of money by paying proper attention to the problem.

Edinburgh Section

The Evolution of the Industrial Chemist

THE opening meeting of the Edinburgh and East of Scotland Section of the Society of Chemical Industry was held in the hall of the Pharmaceutical Society of Great Britain on Tuesday evening, when Dr. D. S. Jordan, president, after some routine business, delivered the inaugural address of the Session on "The Evolution of the Industrial Chemist." He said the first essential in the education of the industrial chemist was that he should receive at school an elementary acquaintance of mathematics, be able to write in a readable hand, and have ability to express himself clearly and concisely, and given these he had the foundation on which to build the future fabric of his education. So long as the bent of his mind was being formed it was not important that he take up the study of chemistry at school. One or two modern languages should be taught in such a way as that the student might acquire a working knowledge of these languages. However strong their convictions might be as to the mentality, morality and methods of the Germans, a knowledge of German laid bare an open book to the study of chemistry, and the student should acquire a working acquaintance of French and German for which he would have little time at his disposal in subsequent years. Their examination system did not qualify a man to do well in later years, and he thought the German system was considerably superior to our own in giving a wide opportunity of acquiring general knowledge. A man's innate capacity ought to be the real deciding point in the choice of his career. Every man had a talent of some sort. No mechanical system could be devised to ascertain what that talent might be, and a

grave responsibility rested on the educational authority in discovering that talent, and advising the student as to his career. An important factor in the choice of the student's career was ways and means. He might take up industrial work and attend technical classes in the evening. That was a rugged path. But if no insuperable financial difficulties stood in his way he might attend day classes at a technical college, or choose a college in his own town or neighbourhood, or, if circumstances permitted, go to some institution at a distance with a good reputation. The student should inquire into the reputation of such an institution, because universities like schools, had their reputations, and the choice of the university or college would be a factor in the students bent and ability. If he learned to teach he might go to one college; if he wanted to go in for research he might go to another, and if he choose industrial work a third might be attended. The student who was to follow out industrial work should become acquainted with the processes with which he would be associated as soon as possible, and his time would thus be better employed than in instruction in some branch of chemistry or other branch of pure science. Provided a man was the type of man to do well in industrial work, he would acquire his knowledge in a short time. Capacity required common sense which was indefinable, memory, a quick working brain, resources in emergency, a mechanical turn of mind and power to apply his chemical training to manufacturing operations on a large scale. Some of these gifts were acquired by the exercise of the will, but others it was not possible to acquire, and it was impossible to emphasise too strongly the fundamental importance of gauging the character of the man. Any education was defective if it failed to teach a man when to realise where his knowledge ceased. Self-confidence was one thing, but it to some extent failed, if it led to the most offensive of all diseases—swelled head. The chemist should make it his aim to qualify himself as quickly as possible to take charge of the actual processes and avail himself of any opportunity of doing so that presented itself to him. Provided a man made good, the next thing he had to do was to aim for management. Ability to handle men was largely a natural gift, but if the capacity was not in the man no amount of theoretical training and experience would instil it into him. There was ample opportunity for the exercise and cultivation of this power in managing a works. Dr. Jordan concluded by alluding to the importance of young chemists joining in good scientific society and meeting with others not only to exchange knowledge but from a purely business point of view; and they should read scientific journals.

A discussion followed in the course of which Mr. J. R. Hill said it required some courage to speak out so frankly as the President had done with regard to the study of German. They had fought a great fight and won a great victory; but if they were narrow-minded enough to refuse to make themselves acquainted with a language in which so much literature had been written and cut themselves off deliberately from a great storehouse of extremely valuable information, the time had come when they should abolish all sorts of prejudice and distinctions of that kind. Science had always been international. During the war it had frequently happened that the scientific leaders had been able to continue friendly intercourse on scientific matters. The question was very much debated as to value of written as compared with oral examinations. He had had many opportunities of sizing up different methods, and he thought a combination of the two was best He agreed with Dr. Jordan on the question of the sorting out of students by the teaching profession and spoke of it as a great misfortune that in certain public schools brilliant boys were picked out and pushed on for the honour of the school, while the common crowd was allowed to survive as best they could.

The discussion was contributed to by Dr. Dott, Dr. Drinkwater, Dr. Cumming, Mr. Stewart, Mr. Romanes, Mr. Kemp and Mr. Findlater.

Dr. Jordan also read a short paper on "The Causes of Loss in Steam Boilers and Plant using Steam."

NITROGEN PRODUCTS & CARBIDE CO., LTD.—Notice has been issued by the liquidator of Nitrogen Products & Carbide Co., Ltd., to creditors to send in their claims to him at Winchester House on or before December 10th.

Powers of Chartered Societies

Jenkins v. Pharmaceutical Society

IN the Chancery Division on Wednesday Mr. Justice Paterson gave judgment in an action by a Member of the Council of the Pharmaceutical Society to test the Society's powers to take up certain branches of work which he contended were *ultra vires*, because they were for the benefit not of the whole of the membership, but of part, viz., the employing members of the Society. The Society were seeking powers, amongst other things, to regulate the hours of work, the conditions of employment, to keep an employment register, and register of unsatisfactory employees, and to regulate the price at which articles were to be sold, and other things. For the Society, it was argued that all the things desired to be done might fairly come within the scope and in the Society's charter which dealt with things that might be done for the protection of the business of members.

In delivering judgment Mr Justice Paterson held that the Society's Charter which mentioned as one of its objects the protection of members who carried on the business of chemists or pharmacists, did not justify the Society in undertaking all kinds of insurance business as might be done under the Society's proposals. Nor did the Charter justify the Society in regulating the hours of business, the wages and conditions of work in the industry, and the prices at which articles were to be sold. Such action would, in fact, convert it into a trade union, and such conversion was never contemplated when the Charter was granted. Similarly, the Society were not entitled to spend money on promoting and maintaining an industrial Council Committee to regulate the hours of business, wages and conditions of work in the industry, and there would be declarations to this effect.

Merchants and Colour Supplies

MR. F. T. T. REYNOLDS, chairman of the executive council of the Chemical and Dyestuffs Traders' Association, in a communication on this subject to the *Manchester Guardian Commercial*, states:—

"The pre-war policy of the German makers was certainly to get into the closest possible touch with consumers, but some of the largest and most successful firms appreciated and continued local mediums for distribution. Advantages arising therefrom were not without appreciation from consumers. Moreover, it is doubtful whether arrangements which allowed the foreign manufacturer to market his wares in this country in a manner evading or avoiding a full proportionate share of taxes and rates could have been permanently allowed.

"What the Chemical and Dyestuff Traders' Association emphasised at the Board of Trade was the importance of the merchant factor in building up, restoring and maintaining import and export trade. The merchant frequently imports essential commodities in such quantities as allow him to sell for home consumption upon very favourable terms, and to re-export his surplus supplies upon terms often advantageous to him and also to the general trade of the country. The Board of Trade quite appreciate the importance of the re-export trade, and show a disposition to consider any reasonable suggestions and to act thereupon if they appear sound and advantageous in the general interest.

"The suggestion that the various interests most affected should meet together and endeavour to formulate an agreed scheme is worthy of serious consideration. So far as the traders are concerned there would be no difficulty, and it is to be hoped that the other interests affected will come to the same conclusion, in which event, perhaps, the department concerned at the Board of Trade may take the initiative in arranging for such a conference.

Magnesium from Sea Water

A PROMINENT Norwegian scientist, Professor Helland Hansen, in a lecture on the possibilities of the utilisation of sea-water for obtaining raw material for Norwegian industry, declared that the Norwegian salt works at Bergen would be able to produce nearly 500 tons of salt and 100 tons of metallic magnesium, besides gypsum and other things. The raw mateials sed were sea water and electric power. Metallic magnesium was 35 per cent. lighter than aluminium and an alloy with 80 per cent. of magnesium had excellent qualities, and was most profitable for use for all motors, especially for those of aeroplanes, automobiles, and electric tramcars.

Prof. Findlay on the Chemical Outlook

PROFESSOR FINDLAY, addressing the opening meeting of the chemistry class at Aberdeen University, said the position in this country of chemistry and of science generally in pre-war days being highly unsatisfactory was now very widely accepted. During the war the profession of chemistry took on a new character and assumed an importance hitherto unrecognised in this country. He thought the prospects before an honours graduate in science of making a successful career for himself were very encouraging. There was at the present time, it was true, an unprecendented number of honours students in chemistry at all the universities, and especially of the English universities, but at the same time, the number of openings for highly trained and able chemists was much greater than before the war.

Chemists in Industry

When one recollected that in Switzerland and in Germany there were, per unit of the population, about 50 times the number of chemists that there were in this country, it would be clear that if our industries were to employ chemists in numbers at all comparable with those formerly employed in Germany—and it was only by so doing that we should be able to maintain our position as an industrial nation—for some time to come the supply of competent chemists would fall short of the demand. In industry, provided the present unrest did not continue too long, there would be an increased demand for analytical, research and process chemists. Further, with the establishing and development of new industries in India and in our Overseas Dominions, fresh and numerous openings would be created for chemists trained in the universities of this country. But it was not only in the industrial side that new openings would arise. To supply the demand for well-trained chemists the number of students in the universities would, they might confidently expect, undergo a considerable and permanent enlargement, and this would necessitate larger staffs of assistants, lecturers and professors, and new openings would therefore be created for those graduates who preferred an academic to an industrial career.

Professor Findlay pointed out that there was a wide sphere for chemists in India, where large staffs of highly-trained chemists were required if the work of the various research institutes was to be carried out in a satisfactory manner. The remuneration and conditions of the service proposed were attractive and salaries varied from £650 to £4,200. He commended the service to the attention of their future honours graduates.

There was another direction in which he would strongly urge their future honours graduates to seek a career, namely, in the Home Civil Service of this country.

The Scientific Glass Co., Ltd.

BY a resolution of the shareholders passed on October 9, Mr. T. E. Rowell, 33, Bedford Street, North Shields, was appointed liquidator of the Scientific Glass Co., Ltd. A meeting of the creditors was held at 3 p.m. on Monday, the 25th inst., at the offices of the company's solicitors, Messrs. Keenlyside & Foster, Lloyds Bank Chambers, Collingwood Street, Newcastle-on-Tyne, in accordance with Section 188 of the Companies' (Consolidation) Act, 1908. In a circular to the shareholders the liquidator says: "The enclosed notice of meeting of creditors is similar to the notice of the 18th ultimo. The first meeting took place in accordance with the first notice, but owing to a technical defect in the form of the resolution of the shareholders for the voluntary liquidation of the company, it has been necessary to hold a further meeting of shareholders, and now to hold a fresh meeting of creditors. At the first meeting of the creditors the position was explained, but it was impossible to make any offer, although it is anticipated that the assets should realise 10s. in the £."

Blending Asphalt

The Continental Asphalt & Petroleum Co., Oklahoma City, is building a plant at Dougherty, Okla., to make use of three grades of asphalt found there, which it is believed will form road-building material of exceptional value. The grades are limestone asphalt, sandstone asphalt and liquid asphalt. The first is too hard for road surfacing, and the second is too soft. Accordingly, the Continental is having constructed there a refinery that will blend the two with liquid asphalt in proportions that will make a good composite.

Rubber Seed Oil

FROM time to time in recent years references have been made to the possibility of extracting the oil from the seeds of the Para rubber tree. Experiments have been made, both in this country and in the Federated Malay States, and the results were such as to encourage those who claimed that the seeds had a commercial value. At first it was believed that rubber seed oil would prove a substitute for linseed oil; but as yet this belief has not been substantiated, though further experiments by chemists may bring about developments which may make it worth while for the planting companies to collect the seeds for the sake of the oil they contain.

In his report on the Agricultural Department of the Federated Malay States in 1919, just to hand, the Director of Agriculture (Mr. L. Lewton-Brain) states that the experimental hydraulic oil-expression plant of the Department has been lent to the Malayan Oil Mills, Ltd., a local company formed primarily to manufacture rubber seed oil. It has been ascertained that seed on storage deteriorates and produces an oil containing up to about 25 per cent. free fatty acids, and that such oil is not generally suitable as a substitute for linseed oil. Further, this oil is not suitable for many purposes owing to its slower drying power compared with linseed oil, and it is necessary to prepare a "boiled" oil for commercial purposes. Considerable progress has been made in the work of refining the oil, but it is probable that the processes required can only be carried out in a factory under the supervision of a trained chemist. Experiments on the preparation of "boiled" oils have shown that a satisfactory product can be obtained form a raw oil free from fatty acids. A further problem, namely, the prevention of the deterioration of seed on storage, remains to be attacked. Freshly collected seed yields an oil with a very low acid content.

Anglo-Argentine Export & Import Co., Ltd.

UNDER the compulsory winding up order made against the Anglo-Argentine Export and Import Co., Ltd., 14, St. Mary-at-Hill, E.C., on May 18, Mr. H. E. Burgess, Official Receiver, has issued to the creditors and shareholders a summary of the company's statement of affairs showing unsecured liabilities £2,226 10s. 8d., and assets valued at £129 14s. 6d.

In his report on the failure, the Official Receiver states that the company was incorporated on September 11, 1919, to carry on business as produce and general merchants. The issued capital at the date of the winding-up amounted to only £2. The company was promoted by Richard Modern and Maurice Woolf. The company advertised in the chemical trade papers, and customers were asked to pay cash with order. In this way the company has received £435. Modern states that when he accepted cash with orders he understood that Woolf was arranging for the delivery of the goods from Germany, but Woolf appears to have done nothing beyond going there and placing orders, which were for the most part not executed, and he has not yet submitted an account as to how he dealt with the funds placed at his disposal. About £1,203 of the liabilities are for goods supplied.

The Official Receiver is acting as liquidator.

Potash from Kelp

ANALYSES have been made of a number of specimens of kelp collected at various places off the Australian coast, with a view to determining their iodine and potash contents. On the average, the posash contents of the ash was shown to be about 14 per cent., although individual samples have yielded as high as 30 per cent. Before any expression of opinion could possibly be given as to the likelihood of a new commercial source of potash being developed, much further investigation would be necessary, and this would involve a great deal of expense. In the first place, there would need to be a thorough exploration of the fields of kelp in order to determine their extent and also the suitability of their location for continuous harvesting. If collection were rendered intermittent on account of rough seas, stoppages would seriously tend, even where fields were dense, to make the recovery unprofitable. In California, very large sums of money are being spent upon the experimental work in progress, and the results of the work are being followed with close interest by many countries.

Views on Chemical Traders' Policy

THE chemical correspondents of both the *Times Trade Supplement* and the *Manchester Guardian Commercial* contribute articles to the current issues on the memorandum recently presented to the Board of Trade by the Chemical and Dyestuff Traders' Association.

The former, after noting the fact that the memorandum refers to the old grievance of the colour users regarding the difficulty of obtaining adequate supplies, says: "What is of far more interest to chemical manufacturers is the suggestion that further measures should be taken to improve the home production. It is difficult to see how this opportunity to consolidate their ground can ge given to them without the system of licensing imports to which the Government is pledged. The market is open at present, and it is certain that the importation of dyestuffs from Germany and the United States is growing. There is no desire in any quarter to stop the importation of colours of which the British production is inadequate for the needs of the country, but it is certain that the rates of exchange give Germany a chance of swamping our market with the commoner classes of dyestuffs which we can produce in bulk.

A Plea for a United Policy

"Lancastrian," writing in the *Manchester Guardian Commercial* on the same subject, says: "During the war quite a small army of so-called agents for aniline colours sprang up, and the anxiety shown by the old-fashioned firms to dissociate themselves from this mushroom growth is easily understood in view of the legitimate trade done by them in dyewares in pre-war days; but it should be pointed out that even these firms did not then handle synthetic (and therefore mainly German) colours on a really large scale. The real concern of the Chemical and Dyestuffs Trading Association, we may assume, is for the trade in colours bought for re-export. Every agent knows the type of collective order placed by a foreign firm. If the order includes dyestuffs, these must be bought in the cheapest market, says the Association, and up to a point the case is sound.

Discussing the different policies of different sections, the writer says:—"One side has Protection at the back of its mind, another Free Trade, whilst a third is divided against itself. The absurdity of this pull-devil-pull-baker policy is most disturbing in view of the proximity of fresh legislation. Why cannot the conflicting interests meet and thrash out an equitable licensing system for the good of the country at large? Their united demands would have influence, whereas if each organisation continues to press its own view the Government will blunder again, and British trade cannot afford a repetition of the administrative ineptitude which has so far characterised official licensing schemes."

Liquid Fuel from Coal

"COAL as a Future Source of Oil Fuel Supply" was the title of a paper read before the Institution of Petroleum Technologists, on October 12, by Sir Arthur Duckham.

After dealing with the subject of the importance of oil for fuel, and pointing out that our only direct source of supply is our coalfields, Sir Arthur referred to the different processes for the heat treatment of coal. After having reviewed the processes, he said:—

"I venture to formulate a system of manufacture to meet the demand for liquid and gaseous fuels for practically all purposes. The total gasification of coal is essential, preferably in one vessel. The plant must be economical in first cost, and low in labour charges, but above all the maximum amount of the volatiles in the coal must be recovered in a liquid form, being distilled over at such temperatures and in such a manner that a minimum of cracking takes place. The gas afterwards should be stripped of all saturated hydrocarbons and supplied to the consumer constant in heat value and specific gravity. Further, special care must be taken to preserve the ammonia obtained from the nitrogen in the coal. The plant must be designed to work with any coal, but I do not believe it possible to design a plant of this type capable of working greatly varying coal over short periods, or of working coal containing, say, over 60 to 70 per cent. of fines. The form of plant I would suggest is one of more vertical retorts superimposed over a water gas producer, the retorts being so constructed and heated that even difficult coals like Durham will work through without undue attention, and the coal fully converted into coke before entering the producer. The producer should be built and worked to obviate the formation of hard clinker, with mechanical grates for the continuous and clean removal of the ash. Automatic compensating devices would have to be included for the regulation of the pressure in the retorts during the run and blow periods. Such a plant, fitted with recuperators and waste heat boilers, would have a very efficient heat cycle, which would undoubtedly result in a large conservation of fuel. If the major portion of the coal used in this country were first treated by such a process, the fuel oil position would be made much easier, as greatly increased supplies would be forthcoming, the demand would accordingly greatly increase, and, as far as I can calculate, gas could be distributed to consumers at from one and a half times to twice the amount it would cost per heat unit to supply as solid fuel. The saving in labour and transport, the cleanliness, and the efficiency of utilisation would far more than compensate for this increased charge."

Rice Oil Dispute

A SPECIAL case stated on an arbitration arising out of a dispute from a contract for sale of 25 tons of rice oil came for decision before Mr. Justice Rowlatt in the King's Bench Division on Wednesday. The sellers were the Hull Oil Manufacturing Co., Ltd., Stoneferry, Hull, and the buyers were Messrs. Dexters, Ltd., of City Road, London.

Mr. Campion, who appeared for Messrs. Dexters, said the oil was used for soap manufacture. It was not an edible oil. It was produced by the Hull company in considerable quantities. The contract price was £95 per ton, payment seven days from delivery. There was no delivery and the arbitrator had found notwithstanding that the buyers were under obligation to pay to the sellers £4,601. He found the oil was edible oil, and that it was customary not to barrel edible oils until delivery was required. Delivery was to be made in April. On May 28 the sellers sent the buyers an invoice and said they would be charged for storage and insurance from June 7. The buyers replied that the contract had been overlooked by them, but the sellers' tender was out of date and the contract was at an end. Counsel contended that the sellers should have tendered the goods in the contract period, and as they did not do so the contract was terminated. Further, the oil was non-edible, and it was not in a deliverable state in barrels ready for delivery. Without calling on Mr. Raeburn, K.C., for the sellers, Mr. Justice Rowlatt gave judgment upholding the award He said it was for the buyers to take the initiative in regard to delivery, but apparently they forgot all about the contract and did nothing at all. They were clearly in default and had no right when the matter had hung over a month to cancel the contract.

American Potash Prospects

THE American potash industry is reported to be in a more promising condition than at any time since the armistice, and production in 1920 is expected to exceed even that of 1918. The situation has been improved by the refusal of the German syndicate to quote prices at American ports. This throws the burden of securing ships, negotiating freight rates, and absorbing demurrage on the American purchaser. On the other hand, the producers have had to face labour difficulties and trouble in obtaining materials. In Nebraska, the abnormal rainfall has so diluted the brine as to make a much greater amount of evaporation necessary just at a time when fuel prices are at their highest. Large new plants are being built at Searles Lake, Marysvale, Utah, and at New Brunswick, N.J.

Searles Lake producers, it is stated, have reduced the borax content of their potash to 0·5 per cent. In that connection it is pointed out that the borax content of the Searles Lake potash never was so great as to be hurtful when used under normal conditions.

Damage resulted only where prolonged drought prevented the washing out of the borax. The lowering of the borax content is a very simple matter, and could have been done before had it been known that it possessed an element of danger. The company which produced the potash which caused some small damage to crops is not selling its potash for fertiliser purposes this year, its entire output having been purchased by chemical users.

From Week to Week

Mr. T. T. Stone, oil and colour merchant, of Bath, is seeking re-election as a Member of the Bath City Council.

Mr. E. McKenzie Taylor has resigned his appointment as Chemist to the Essex Agricultural Committee as from Nov. 13.

Protest has been made by the Painters Union to the Bath City Council against the use of tar products in connection with the construction of houses in Bath. The letter has been referred to the Corporation Housing Committee.

Essex Agricultural Committee are to receive from the Ministry of Agriculture a special grant of £200 for work in connection with phosphate experiments.

B. Laporte, Ltd., of Luton and Bradford, now supply the tanning industry with bisulphite of soda, formic acid in strengths up to 90 per cent., acetic acid, oxalic acid.

Nottingham has received from Sir Jesse Boot, one of its celebrated natives, many munificent gifts. In return the honorary freedom of that city was on Monday conferred upon him.

Trinidad Chamber of Commerce has declared itself against the retention in the Canada-West Indies trade agreement of the Dutch colour test for sugars which are to enter the Dominion under the new scale of preference.

We are informed that T. Paulding & Co., Ltd., Brazennose Street, Manchester, have now been registered as a private limited company. The business will be carried on under the same management as heretofore.

It is reported from Paris that petroleum has been located in the Commune of Montaut, near St. Sever, in the Department of the Landes, by Professor Genty and M. Dubalem. It is estimated the oil area is nearly 2,000 acres.

On October 21st the first of the season's lectures on subjects connected with the British glass industry was delivered at the Royal Society of Arts by Mr. A. J. Caddie, Director of the Potteries Museums, Stoke-on-Trent.

The business of E. Gihl & Co., Manchester, has been taken over by Mr. John R. Scholes, 14, Argyle Chambers, 67, Hanging Ditch, Manchester, dealer in chemicals, colours, minerals, and oils.

Writing to the *Times Trade Supplement*, Mr. T. Lester Swain, for the Chairman of the British Chemical Ware Manufacturers' Association, says that the chemical, scientific, and optical branches are already feeling the effects of German competition.

The annual dinner of the Manchester section of the Society of Chemical Industry is announced for Friday, November 26, at the Grand Hotel. The guests will include the president of the Society (Sir W. J. Pope), the Lord and Lady Mayoress of Manchester, and the Mayor and Mayoress of Salford.

Addressing the members of the Batley and District Textile Society on Friday, Mr. T. C. Taylor said that chemicals which were absolutely deleterious had in some instances been used in the weighing of clothes. These chemicals had hygroscopic qualities which caused cloth to hold water and gave colds to people who wore garments made of it.

Opium, alcohol, strychnine, and tea have been taken by way of experiment for scientific purposes by Miss May Smith and Mr. William McDougall, F.R.S. They suggest as the result of their experiences that alcohol and chloroform are grouped together in their effect on the nervous system, and strychnine, opium and tea are another group.

At the meeting on Monday next of the London Section of the Society of Chemical Industry in the Lecture Theatre of the Institution of Mechanical Engineers, Storey's Gate, S.W., Sir W. J. Pope will deliver an address on "The Photography of Coloured and of Distant Objects." Previous to the meeting the members are invited to dine together at the Victoria Mansions Restaurant.

Scientists will read with some feeling the announcement of the death from starvation of Dr. Max Margulan, formerly secretary of the Central Meteorological Institute in Vienna. Although until fifteen years ago Dr. Margulan was a world-known name in meteorology, since then he had devoted his time and interest to the study of chemistry. He had a small laboratory fitted up in his own house and lived in comparative retirement.

There has been under consideration by the members of the Glasgow Chamber of Commerce the question of the Employment Exchanges, and their value in obtaining the services of suitable workers. A number of firms in the chemical and allied trades were asked for their opinion on this matter, and in no case were these firms able to report satisfaction with the work of the Exchange. The general feeling was that they were of no service.

A meeting of past and present students, and others concerned with the threatened closing of the Finsbury Technical College, has formed a Defence Committee to consider the possibility of helping in any way the carrying on the work of the College, and thus obviating its closing. Invitation has been thrown open to all who wish to support the movement by becoming a member. Application, with entrance fee of 2s. 6d. should be sent to Dr. Atkinson, Finsbury Technical College, Leonard Street, E.C.2.

Staff changes are taking place at the Ministry of Agriculture. Sir Daniel Hall has expressed his desire to give the whole of his time to the development of agricultural education and research, and to be sufficiently freed from office work to be able to keep in close personal touch with agricultural developments throughout the country, as well as abroad. He will retain his present position as Chief Scientific Adviser and Director-General of the Intelligence Department, with membership of the Minister's Administrative Council.

It is reported from Bradford that representatives of German commercial houses are returning to this country, and in some instances are not being very cordially received. In one case the proprietors of a Bradford hotel on discovering the nationality of their guests asked them to leave. It is stated that a number of Norwegians, Swiss, Danes and Swedes have visited the city recently as agents of German firms. Representatives of German dye-ware firms are reported to have a remarkably full range of colours at low prices. As an example, a certain dye-ware, much required in the Bradford trade, is being offered at 7d. to 1s. a lb., while a similar dyestuff produced in this country is said to cost about 4s. a lb.

A new method of preparing wood fibres for spinning, which is said to yield good results, and to produce a perfect substitute for cotton, is described in the "Textil Zeitung." Instead of attempting to preserve the best fibres in their full length for spinning, as a substitute for long-fibre textiles, the fibres are separated into their original cells, varying between 20 and 50 millimetres in length. The separation process consists first of hydrolysis, the dried material being soaked in a weak acid solution, as the result of which part of the incrusting matter is carried off in solution. The remaining part is easily soluble by the next process, which consists in handling the material with alkali solutions for between six and twelve hours. By this process the long fibres are entirely separated into their short elementary cells. As, however, after drying the cells again stick together, and as washing only partially prevents this they are put into an isolation solution of fatty acids or amides thereof. After this process the cells dry in a condition which, it is said, makes sticking together impossible, yielding a soft, strong material, which can be easily spun by the cotton spinning three-cylinder system.

To Avoid Economic War

SIGNOR TITTONI addressed a meeting of the Press at Brussels on October 25 on the subject of monopolies in raw materials, on which he had presented a report to the Council of the League of Nations. He explained that he did not speak for the Italian Government, and carefully avoiding the mention of names, he suggested that social peace and international solidarity alike required that the countries and organizations which have at their disposal raw materials, such as coal, petrol, iron, and fertilizers, should share those materials fairly with less fortunate countries. Otherwise there was a danger that Labour would turn to the Third International. The economic dependence of one country on another for raw materials meant essential political dependence. The principle underlying his proposal was that the price of products must not be increased for export, and that at all costs economic war must be avoided.

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Rhode Island Patents

Notice has been received at Providence that several patents of much importance have been granted to Rhode Islanders, the rights being assigned to the Nitrogen Corporation of Providence. A process for producing sodium bicarbonate and hydrogen has been patented by Mr A. Nagelvoort. The production of substantially pure carbon and the like has been patented by Mr. R. Williams, of this city. Mr. W. D. Mount, of Saltville, Va., has patented an apparatus for recovering material from solution; and Mr. J. Clancy, of New York, has patented a process for the production of ammonia. These also have been assigned to the Nitrogen Corporation of Providence.

Patent Literature

Abstracts of Complete Specifications

151,314. ROTARY MACHINES FOR TREATING AIR OR GASES WITH LIQUIDS, AND VICE VERSA. W. J. Bulgin, 191, Selly Oak Road, King's Norton, Birmingham; E. A. Hall, 278, Selly Oak Road, King's Norton, Birmingham; and G. Searle, 48, Umberslade Road, Selly Oak, Birmingham. Application date, May 24, 1919.

The rotary machine is of the type in which the gas passes through a perforated rotor which dips into the liquid, the gas thus coming into contact with a large number of liquid films. The rotor is constructed of twisted or corrugated strip metal, expanded metal, or metallic wool, which is wound around the periphery, the successive layers being separated by distance pieces. The rotor may be divided into two or more parts by partitions at right angles to the shaft, so that the gas is compelled to pass backwards and forwards through the perforated walls. A centrifugal fan may be arranged within the rotor.

151,339. ALKALI SILICATES, MANUFACTURE OF, READILY SOLUBLE. F. J. Phillips, 10, Old Burlington Street, London, W. 1, and E. J. Rose, 34, Daybrook Street, Sherwood, Notts. Application date, June 19, 1919.

The object is to prepare soluble silicates or hydrated silicates in which the silica content is higher than that represented by the formulæ $Na_2O.2SiO_2$ or $K_2O.2SiO_2$. A mixture of three parts by weight of sand to one part of alkali (Na_2O) with 0·5 to 10 per cent. of borax to increase the fusibility is fused at 1,200°C., and the vitreous mass reduced to sheets, filaments, &c., which are dropped directly into water to disintegrate them into minute particles. The mixture is then ground with water, to obtain a solution, and gelatinous silicic acid is precipitated by means of sulphuric or other acid. The grinding or agitating is continued and the precipitate is re-dissolved, giving the soluble silicate required.

151,344. RAW RUBBER, TREATMENT OF, WHEN FRESHLY COAGULATED FROM THE LATEX. S. C. Davidson, Sirocco Engineering Works, Belfast. Application date, June 20, 1919.

Raw rubber, which is freshly coagulated from the latex, usually contains a large proportion of water which is removed by disintegrating the rubber by passing it between rollers rotating at different speeds. This treatment, while removing the water, has a detrimental effect on the quality of the rubber, and to avoid this the rubber sheet is first perforated from both sides by numerous sharply pointed pins. The water may then be expressed by passing the sheet between rollers rotating at the same speed, thus avoiding the disintegration of the rubber.

151,422. SULPHURS AND VERMILIONS OF ANTIMONY, MANUFACTURE OF GOLD-COLOURED. P. Chaillaux, 2*bis*, rue Caumartin, Paris. Application date, August 1, 1919.

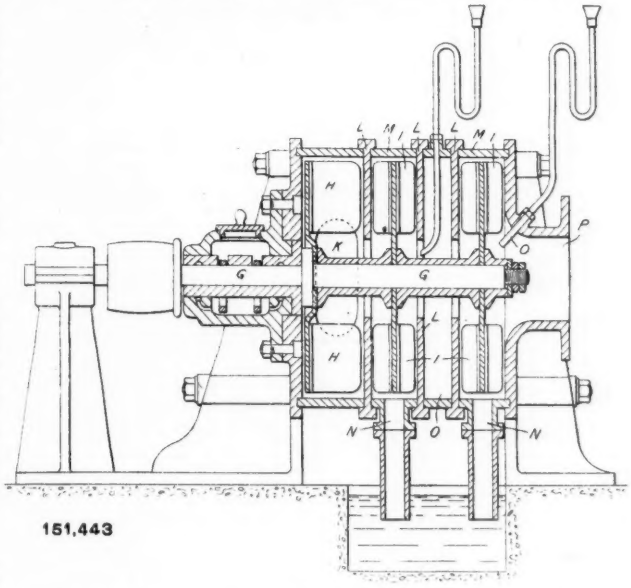
The natural sulphide of antimony is melted in a closed vessel, and a current of sulphur dioxide or sulphuretted hydrogen is passed through it. The higher sulphides of antimony required are thereby produced, and are collected as a dry powder in a settling chamber. The sulphur dioxide required may be obtained by melting a mixture of the natural sulphide and sulphur and passing air or oxygen through it.

151,440. PULVERISERS. A. E. Davis, 2, Hagley Grove, Hagley Road, Birmingham. Application date, August 16, 1919.

The material to be pulverised is fed into a casing containing rotating beaters, and the finely powdered material is drawn off by suction. A flat vertical chamber is fixed over the outlet of the pulverising chamber, and is divided into two parts by a central vertical screen. One of the compartments thus formed communicates at the bottom with the pulverising chamber, and the other communicates at the bottom with the suction fan so that the powdered material is drawn through the screen. Coarser material falls back into the pulverising chamber.

151,443. GAS CLEANING APPARATUS. J. F. Wells, 36, Sharia Falaki, Cairo. Application date, August 20, 1919.

The apparatus is for extracting tar from gas. A rotating shaft *G* carries a series of paddles *H* acting as a fan, and bounded by the casing and a partition *L*, which has a central opening. A series of paddles *I* are next mounted on the shaft between partitions, and are followed by a space containing a water supply pipe, and then by another series of paddles *I*. Gas enters by the passage *P*, and passes the outlet *O* of a water



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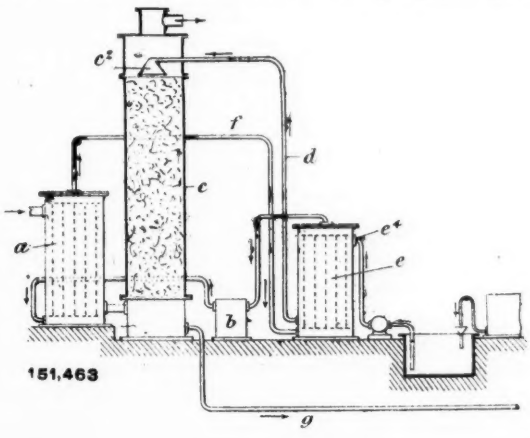
supply pipe to the revolving paddles *I* by which the tar is extracted centrifugally, and discharged through the outlet *N*. The gas then passes inwards against centrifugal force to the compartment *O*, to which water is supplied, and then to the next compartment *M*, containing a tar-extracting paddle. The gas is finally discharged through an outlet *K*. The apparatus is built up so that the number of tar-extracting paddles may readily be increased or decreased.

151,463. NAPHTHALENE FROM GAS OBTAINED BY THE DISTILLATION OF COAL, APPARATUS FOR THE COMPLETE EXTRACTION OF. D. Marbais, 3, rue de Teheran, Paris, and C. Deguide, 2, rue de Pommeret, Montmorency (Seine et Oise), France. Application date, September 13, 1919.

Coal gas is passed into a cooler *a* supplied with cold water from a cooler *b*, and enters the bottom of a scrubbing tower *c* at a constant temperature of 18°C. The gas passes upwards



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through the tower, where it comes into contact with anthracene oil, which is delivered at c^2 at a temperature of 22°C. The oil absorbs the naphthelene, and is drawn off by the pipe *g* to an apparatus where it is freed from hydrocarbons by steam distillation. The oil is returned through the cooler *e* which restores it to the temperature of 22°C., and it is then passed again through the pipe *d* to the tower *c*. The apparatus *e* may be cooled by water from the cooler *a*, which is passed through the pipe *f*. The hot anthracene oil entering the cooler at e^4 is saturated with about 4 per cent. of benzol to prevent the subsequent absorption of benzol from the coal gas.

NOTE.—The following specifications, which are now accepted, were abstracted in THE CHEMICAL AGE when they became open to inspection under the International Convention: 130,969 and 130,970 (U.S. Industrial Alcohol Co.), relating to production of esters, see Vol. I., page 504; 141,666 (Rochette Freres), relating to preparation of pure alkaline aluminates, *see* Vol. II., page 699.

International Specifications Not yet Accepted

148,264. PHENOL-ALDEHYDE CONDENSATION PRODUCTS. Soc. Coralex, 18, Place de Laborde, Paris. International Convention date, July 19, 1919.

The crude condensation products of phenols and aldehydes are washed with hot water, dilute mineral acid, and cold water, to purify them. The resins may be converted into insoluble products by heating to 100°C., and into varnishes by dissolving in alcohol, acetone, or amyl acetate. The resins may be combined with aluminium hydrate or with glycerine and ferrous hydrate, or with other bases or alcohols.

148,268. TANNING AGENTS SYNTHETIC. M. Melamid, 56, Loretto-strasse, Freiburg, Breslau, Germany. International Convention date, July 19, 1919. Addition to 137,323. (*See* THE CHEMICAL AGE, Vol. II., page 287.)

The alkali-soluble portions of anthracene oil are sulphonated with sulphuric acid monohydrate, and the product dissolved in water and neutralised with caustic soda. The product is freed from sodium sulphate by concentration, and the solution is mixed with caustic soda and condensed with a benzene solution of toluene sulphochloride.

148,291. OXIDISING OILS. G. Schlicht Akt.-Ges., Aussig, Czecho-Slovakia, and A. Eisenstein, Wallstrasse, Leitmeritz, Czecho-Slovakia. International Convention date, April 16, 1919. Addition to 147,661.

The finely divided oxidised product is coated or impregnated with the oil which is to be oxidised, and exposed to air or oxygen. As an example 100 parts of linoxine may be mixed with 50 parts of linseed oil.

148,339. DYES AND INTERMEDIATES. L. Cassella & Co., Ges., Frankfurt-on-Main, Germany. International Convention date, March 15, 1915.

Hydrazine or a salt is condensed with 1-amino-anthraquinone-2-aldehyde or its azomethine compounds. To obtain the parent azomethine compounds, 1-amino-2-methyl-anthraquinone is heated with aromatic nitro compounds and alkalis, with or without primary aromatic amines. When these compounds are hydrolysed by acids, 1-amino-anthraquinone-2-aldehyde is obtained.

148,349 and 148,350. INDIARUBBER, VULCANISING. E. Tilche, 67, Rue de Tocqueville, Paris. International Convention date, July 18 and July 11, 1919.

148,349. India-rubber is vulcanised at about 145°C. in an atmosphere of ammonia or a volatileorganic alkali which may be diluted with an inert or reducing gas. No addition of litharge is necessary.

148,350. The process is similar to that described in 148,349. Ammonia is used in the proportion of 250 grams per cubic metre of the vulcanising chamber, and the inert gas may be previously compressed when thick articles are being vulcanised.

148,351. ZINC SULPHIDE AND OXIDE. A. Helbronner, 49, Rue St. Georges, Paris. International Convention date, Oct. 16, 1916.

Zinc sulphate, sulphuric acid, and sawdust, with or without magnesium sulphate or other alkaline earth or alkali sulphate, are calcined in a closed chamber, and the product is washed with water acidified with sulphuric acid to remove magnesia and zinc oxide. Pure zinc sulphide is obtained. If barium chloride is added to the washing water, barium sulphate is precipitated with the zinc sulphide. If the zinc sulphate in the original mixture is replaced by zinc oxide, pure zinc oxide is obtained.

148,354. ROTARY RETORTS. Soc. Anon. Enterprises Simon-Carves, 39, Rue de la Boetie, Paris. International Convention date, June 4, 1918.

Peat, lignite, vegetable matter, &c., is fed from a hopper into a rotary horizontal retort by a screw conveyor attached to the retort, and is fed through the retort by paddles arranged helically. The gases are led off through a central pipe at the other end to a condenser, and the non-condensible gases are used as fuel for heating the retort. A lateral outlet for the discharge of the solid residue is also provided at this end of the retort, and is controlled by a valve which is operated when the outlet is in the lowermost position by striking a fixed projection on the retort setting.

148,358. FATTY ACIDS. G. Teichner, 3, Anton Frankgasse, Vienna. International Convention date, May 15, 1919.

Mineral oils containing at least 90 per cent. of hydrocarbons of the methane series are purified by fuming sulphuric acid and then oxidised by blowing through air or oxygen at 110°C. in the presence of zinc stearate, to obtain fatty acids. The products may be converted into soaps.

148,366. SYNTHETIC RESINS. H. Bucherer, 25, Wurtembergallee, Charlottenburg, near Berlin. International Convention date, March 22, 1919.

Addition to 148,139. (See THE CHEMICAL AGE, Vol. III, page 455.)

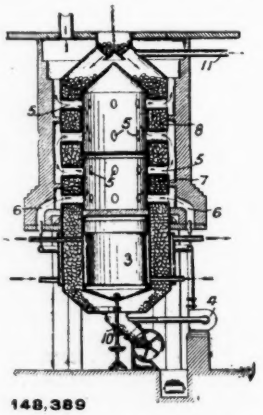
Resinous condensation products from phenols and formaldehyde are treated to obtain derivatives by introducing the radicals of valeric, bromvaleric, cinnamic, salicylic or mandelic acids. The resins may alternatively be condensed with amines, phenols, aminophenols, &c. In one example the product derived from cresol and formaldehyde is treated with phenol and phosgene in alkaline solution or with a mixture of the three cresols or the two naphthols instead of phenol. The product in the last case is a resin difficultly soluble in most organic solvents.

148,373. YEAST. Fleischmann Co., 701, Washington St., New York. (Assignees of M. Nilsson, 505, South St., Peekskill, New York, and N. S. Harrison, 33, Sholebroke Place, Leeds, England). International Convention date, Jan. 7, 1919.

Beet or cane molasses are fermented in presence of phosphorous or phosphoric acid, sodium, potassium or ammonium phosphate or acid phosphates of calcium or magnesium, the liquid being kept neutral during fermentation by adding alkalies.

148,389. CARBONISING PEAT, LIGNITE, &c. Berztit Ges., Munich, Germany. International Convention date, Oct. 26, 1918.

Carbonisation is effected in an annular vertical retort which



148,389

is heated by hot gases which are admitted at 6 and pass backwards and forwards through the material by means of horizontal pipes 5. The temperature at the lower part 7 is maintained

at 300°-350°C., and at the upper part 8 about 150°C. Distillation gases are withdrawn at 4 and water vapour at 11, while the solid residue is cooled in an extension 3 of the retort and then withdrawn at 10.

148,408; 148,419. TETRAHYDRONAPHTHALENE DERIVATIVES, Tetralin Ges., 5, Behrenstrasse, Berlin. International Convention dates, May 18, 1916, and Feb. 25, 1919.

148,408. Tetrahydronaphthalene is converted into tetrahydronaphthalene-β-sulphonic acid by treatment with sulphuric acid, and this derivative may be fused with sodium, potassium, or calcium hydroxide to give tetrahydro-β-naphthol. The latter may be heated with sulphuric acid and nitrated to yield di-nitrotetrahydronaphthol. The further treatment to produce sulphochlorides, thio compounds, and disulphides is also described.

148,419. The production of a mixture of 1- and 2-sulphochlorides by treatment with chlorsulphonic acid is described, and also their separation by several different methods. Other derivatives are described, including the production of tetrahydro-naphthyl-thioindigos.

148,436. COAL, OBTAINING LIQUID PRODUCTS FROM. F. Bergius, 14, Tiergartenstrasse, Berlin. International Convention date, Aug. 22, 1916.

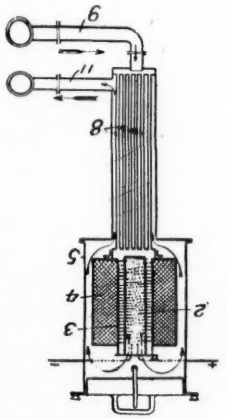
Coal containing not more than 85 per cent. of carbon after eliminating ash, is mixed with tar oil and heated in contact with hydrogen at a pressure of 100 atmospheres. Under these conditions 87 per cent. of the coal may be converted into liquid products.

148,497. CALCINING FURNACES. A. V. Gowen-Lecesne, 233*bis*, Rue du Faubourg St. Honoré, Paris. International Convention date, Apr. 3, 1919.

The furnace is for calcining siliceous rocks, refractory clays, magnesia, dolomite, chrome iron, spinel, emery and corundum powders, and zirconium and cerium earths. The material, together with fuel, is placed in a furnace mounted on trunnions, and air is supplied under pressure at the bottom. The charge is cooled by continuing the air blast and the product is tilted out. The furnace may be modified to act continuously.

148,564. OXYGEN AND HYDROGEN. G. F. Jaubert, 155, Boulevard Malesherbes, Paris. International Convention date, Oct. 12, 1918.

The object is to purify oxygen or hydrogen containing a small proportion of the other gas as an impurity by passing the gas over catalytic material. The catalytic material 2 is embedded in heat insulating material 4, enclosed in a chamber 5. The gas enters by a pipe 9, passes through a heat regenerator 8 to the catalyst 2, and returns through the regenerator to the outlet 8. An electric heating coil 3 is provided to start the reaction. The utilisation of the heat of the reaction in the regenerator permits the use of poor contact material.



148,564.

148,579. SULPHONIC AND ALKYL-SULPHURIC ACID, SALTS OF. Sudfeldt & Co., Melle, Hanover, Germany. International Convention date, Mar. 14, 1919.

Mineral or tar oil is treated with fuming sulphuric acid to obtain an acid resin which is agitated with water at 90-100°C., cooled, filtered, and a saturated solution of common salt added. Neutral substances and a small amount of sulpho-acid salts are fractionally precipitated and filtered off, and more salt is then added to precipitate the remaining sulpho-acids, which are washed and purified by treating with alcohol.

LATEST NOTIFICATIONS.

152,643. New dyestuffs of the indigo series. Soc. Chimique des Usines Du Rhone. October 14, 1919.

152,641. Tanning, impregnation, or the like of materials. Elektro-Osmose Akt.-Ges. (Graf. Schwerin Ges.) October 13, 1919.

152,642. Process of separating slags containing iron from coke and other fuel residues. Krupp Akt.-Ges. F. October 11, 1919.

152,643. Processes for separating oxygen and nitrogen and apparatus therefor. Zack, M. October 15, 1919.

152,349-50-51. Process for producing spun material resembling wool or cotton from viscose solutions. Glanzfaden Akt.-Ges. March 27, April 6, August 15.

152,356. Purification of liquids. Koppers Co. February 15, 1919.

152,650. Process of and retort for distillation of fuels. Colombo & Ing. De Bartolomeis, and Bartolomeis, R. de. October 18, 1919.

Specifications Accepted, with Date of Application

3557/1914. Azo dyestuffs, Manufacture and production of. Newton (*Farbenfabriken vorm. F. Bayer & Co.*). Feb. 11, 1914.

121,730. Acid-proof metal alloy: Process for the production of. C. Rossi. December 13, 1918.

129,996. Oil from shale and other carbonaceous materials, Apparatus for recovering. G. W. Wallace. February 8, 1918.

129,997. Carbonaceous materials, Apparatus for distilling. G. W. Wallace. March 26, 1918.

136,818. Porous material, Manufacture of. Norske Aktieselskab for Elektrokemisk Industri Norsk Industri-Hypotekbank. December 16, 1918.

149,988. Cement from slag, Process for the manufacture of. R. Boveroulle. August 7, 1919.

152,041. Separating crystals from mother liquors containing more than one salt. J. T. Windram. August 13, 1918.

152,051. Electrical deposition of particles from gases. Sir O. Lodge, L. Lodge, and Lodge Fume Deposit Co. (*in liquidation*). April 14, 1919.

152,054. Benzol, Process and apparatus for dealing with the acid sludge produced in the purification of—and for recovering benzol and its homologues therefrom. G. Stephenson. May 2, 1919.

152,095. Nitration of oils or fatty acids. G. H. Howse. July 4, 1919.

152,106. Portland cement, Utilisation of low grade carboniferous material in the manufacture of. R. W. Lesley. July 4, 1919.

152,199. Ammonium nitrate explosives, Process for the manufacture of. E. Muller. October 2, 1919.

Applications for Patents

Asiatic Petroleum Co. Dehydrating emulsions and/or distilling oils, &c. 29,821. October 21.

Badische Anilin & Soda Fabrik. Manufacture of anthraquinone derivatives. 29,517. October 19.

British Cellulose & Chemical Manufacturing Co. Manufacture of textile products from cellulose derivatives. 29,629. October 20.

,, Treatment of artificial threads. 29,630. 29,631. October 20.

Cameron, W. Dehydrating emulsions and/or distilling oils, &c. 29,821. October 19.

Campbell, J. S., and Pheaze, A. J. Manufacture of artificial leather and substitutes for rubber, gutta percha, &c. 29,501. October 19.

Clotworthy, H. R. S. Treatment of artificial filaments or threads and of fabrics containing same. 29,630. October 20.

Columbo, & Ing. De Bartolomeis. Distillation of fuels. 29,365. October 18 (Italy, October 18, 1919).

Craig, G. Recovering potash, &c., salts from blast-furnace gases. 29,710. October 21.

Davis, R. H., and Levy, L. A. Generation of oxygen. 29,671. October 20.

Drysdale & Co. Centrifugal pumps. 29,895. October 22.

Duckham, Sir A. M., and Woodall, Duckham & Jones. Furnaces for producing chemical changes. 30,059. October 23.

Lees, W., and Moors, W. Device for continuous agitation of liquids. 29,460. October 19.

Mathieson Alkali Works. Production of barium chloride. 29,882. October 22. (United States, January 20.)

Money, G. J. Chemical fire-extinguishers. 29,420. October 18.

Palmer, C. W. Manufacture of textile products from cellulose derivatives. 29,629. October 20.

Rheinisch-Nassauische Bergwerks-und-Hütten-Akt.-Ges. Rotary roasting and calcining furnaces. 29,532. October 19. (Germany, October 20, 1919.)

Soc. l'Air Liquide, (Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude). Catalytic materials for synthesis of ammonia. 29,850. October 21. (France, October 28, 1919.)

Strache, H. Combustion of bituminous fuels with recovery of by-products. 29,551. October 19. (Austria, August 6, 1919.)

Thermal Industrial & Chemical (T.I.C.) Research Co. Evaporation of liquids. 29,677. October 20.

,, Heating materials at successively different temperatures. 29,678. October 20.

Wacker Ges. für Elektro Chemische Industrie, Dr. A. Manufacture of dichlorethylene. 29,956. October 22. (Germany, December 23, 1919.)

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, October 28.

A hope is confidently expressed that the negotiations now proceeding with a view to the settlement of the coal strike will shortly terminate favourably, and we hope that by the time this issue is published, the present menace to industria peace will have passed away.

It will naturally be some time before business is fully resumed, but if we have industrial peace that fact in itself will tend towards confidence.

Speaking generally, manufacturers seem to be unable to revise their ideas of values and the lower prices which are indicated in some commodities are largely due to over-speculation and to the necessity of realisation.

There has been the usual enquiry from abroad for staple chemicals, but exchange difficulties, together with the industrial uncertainty react severely against business.

General Chemicals

ACETONE has been in active enquiry, both for home trade and export; price is decidedly firm.

ACID ACETIC is in moderately good demand, and stocks have steadily been reduced. Arrivals are very light.

ACID CARBOLIC has been rather more in evidence, although there is considerable room for improvement.

ACID FORMIC is in fairly good enqui y, and the value is unchanged.

ACID OXALIC is only in limited demand at recent values.

ACID TARTARIC.—A decided improvement is indicated in the position of this article. There are practically no imports, and stocks in second hands have been substantially reduced. In some quarters the opinion is expressed that the quantity available on this side is smaller than is generally thought, and that something approaching a shortage will soon make itself evident. In the meantime the second-hand price has advanced sharply.

BLEACHING POWDER.—Makers intimate their willingness to consider export orders for limited quantities at full rates.

COPPER SULPHATE.—The position remains unsatisfactory, and there does not seem to be much improvement, while the depression in the Continental exchanges is so acute.

FORMALDEHYDE is rather lower in price owing to realisations of second-hand parcels. The present price is regarded as below the cost of production.

LEAD SALTS are in rather better demand, but the price is unchanged.

POTASSIUM PRUSSIATE is still enquired for for early delivery. Stocks are low and arrivals very light.

CAUSTIC SODA.—There is still considerable realisation of second-hand parcels, but no further drop in price is indicated.

BICHROMATES (POTASH AND SODA).—English makers are said to have fixed their prices for next year, and the figures will probably be known in a few days' time.

SODA PHOSPHATE is an easy market with little business passing.

SODA PRUSSIATE.—Makers are reluctant sellers and the second-hand price shows a profit to holders.

ZINC SALTS are slow of sale.

Coal Tar Intermediates

There has been little business of interest to report during the current week. Markets are about as they were, and the weakening of prices is in the main due to the realisation of second-hand parcels.

ALPHA NAPHTHALYMINE is without change in value, but little fresh business is to be reported.

BETA NAPHTHOL is featureless. Here and there a parcel may be picked up at under makers' quotations, but it is thought that the present decline in price has been fully discounted.

DIMETHYLANILINE is a shade easier, but little business is reported.

PARANITRANILINE maintains its position, and makers are holding for full figures.

PARANITROPHENOL is in more active request and the price is firm.

SALICYLIC ACID continues lifeless.

Coal Tar Products

The market still remains under the influence of the coal strike, and the tendency of prices is uncertain.

90's BENZOL.—The demand for motor purposes has stimulated business, but there is little change in prices, which remain at 3s. 10d. to 4s. in the north, and 4s. to 4s. 1d. in the south.

PURE BENZOL is quiet with sellers at 4s. 3d. per gallon.

CREOSOTE OIL.—Owing to the difficulties of transport very little business is passing, and prices are unchanged at 1s. 1d. to 1s. 1½d. in the north, and 1s. 2d. to 1s. 3d. in the south.

CRESYLIC ACID.—There is rather more demand, and prices are steady at 3s. 10d. to 4s. for dark 95/97 per cent., and at 4s. 6d. to 4s. 9d. for pale 97/99 per cent.

SOLVENT NAPHTHA is still quiet and nominally at 3s. on rails at works.

HEAVY NAPHTHA.—Very little is being done and prices remain steady at 3s. 3d. to 3s. 5d., according to position.

NAPHTHALENE.—Crude is in good demand at £14 to £24 per ton, according to quality, while refined at the moment is very quiet at about £50 per ton.

PITCH.—The market is irregular and there is no change in the quotations.

Sulphate of Ammonia

Reductions in output owing to coal strike will have the effect of reducing the quantity for export, but home trade prices are unchanged and the demand is normal.

Current Prices

Chemicals

	per	£	s	d.		£	s	d.
Acetic anhydride	lb.	0	3	9	to	0	4	0
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	120	0	0	to	125	0	0
Acid, Acetic, glacial, 99-100%	ton	100	0	0	to	105	0	0
Acetic, 80% pure	ton	75	0	0	to	77	10	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst.	ton	74	10	0	to	76	0	0
Carbolic, cryst. 39-40%	lb.	0	0	10½	to	0	0	11
Citric	lb.	0	3	6	to	0	3	9
Fluoric	lb.	0	0	7½	to	0	0	8
Formic, 80%	ton	115	0	0	to	120	0	0
Gallic, pure	lb.		7	3	to	0	7	6
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol.	ton	58	0	0	to	60	0	0
Lactic, 60 vol.	ton	67	10	0	to	70	0	0
Nitric, 80 Tw.	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	2	0	to	0	2	1
Phosphoric, 1.5	ton	65	0	0	to	67	0	0
Pyrogallic, cryst	lb.	0	11	6	to	0	11	9
Salicylic, Technical	lb.	0	2	0	to	0	2	3
Salicylic, B.P.	lb.	0	2	11	to	0	3	0
Sulphuric, 92-93%	ton	8	10	0	to	8	15	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	2	8	to	0	2	9
Alum, lump	ton	19	10	0	to	20	0	0
Alum, chrome	ton	82	0	0	to	85	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	17	10	0	to	18	10	0

	per	£	s.	d.		£	s.	d.
Aluminium, sulphate, 17-18%	ton	20	10	0	to	21	10	0
Ammonia, anhydrous	lb.	0	2	2	to	0	2	4
Ammonia, .880	ton	43	0	0	to	45	0	0
Ammonia, .920	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	7½	to		—	
Ammonia, chloride	ton	95	0	0	to	100	0	0
Ammonia, muriate (galvanisers)	ton	60	0	0	to	65	0	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	120	0	0	to	125	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	3
Amyl acetate	ton	420	0	0	to	425	0	0
Arsenic, white, powdered	ton	80	0	0	to	82	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	28	0	0	to	29	0	0
Nitrate	ton	55	0	0	to	56	0	0
Barium Sulphate, blanc fixe, dry	ton	30	0	0	to	31	0	0
Sulphate, blanc fixe, pulp	ton	16	10	0	to	17	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	8
Bleaching powder, 35-37%	ton	31	0	0	to	32	0	0
Borax crystals	ton	41	0	0	to	42	10	0
Calcium acetate, Brown	ton	20	0	0	to	21	0	0
,, Grey	ton	34	0	0	to	35	10	0
Calcium Carbide	ton	30	0	0	to	32	0	0
Chloride	ton	10	10	0	to	11	10	0
Carbon bisulphide	ton	65	0	0	to	67	0	0
Casein, technical	ton	75	0	0	to	80	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	13	0	to	0	14	0
Oxide, black	lb.	0	17	0	to	0	18	0
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	42	0	0	to	44	0	0
Cream Tartar, 98-100%	ton	225	0	0	to	230	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	240	0	0	to	250	0	0
Formusol (Rongalite)	lb.	0	4	9	to	0	5	1
Glauber salts	ton		Nominal.					
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	9	to	0	2	10
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	77	10	0	to	80	0	0
Carbonate (White Lead)	ton	61	0	0	to	63	0	0
Nitrate	ton	65	0	0	to	67	0	0
Litharge	ton	57	0	0	to	59	0	0
Lithopone, 30%	ton	48	0	0	to	49	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	12	10	0	to	13	0	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate	ton	190	0	0	to		—	
Sulphate	ton	130	0	0	to	135	0	0
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	gall.		Nominal.					
Nickel sulphate, single salt	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potassium bichromate	lb.	0	1	8	to	0	1	9
Carbonate, 90%	ton	115	0	0	to	120	0	0
Chloride	ton	50	0	0	to	52	0	0
Chlorate	lb.	0	0	9½	to	0	0	10½
Meta bisulphite, 50-52%	ton	260	0	0	to	270	0	0
Nitrate, refined	ton	65	0	0	to	67	0	0
Permanganate	lb.	0	3	6	to	0	4	0
Prussiate, red	lb.	0	4	0	to	0	4	3
Prussiate, yellow	lb.	0	2	0	to	0	2	1
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	5	10	0	to		—	
Seconds	cwt.	5	5	0	to		—	
Sodium acetate	ton	50	0	0	to	52	0	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	1	2	to	0	1	3
Bisulphite, 60-62%	ton	50	0	0	to	52	10	0
Chlorate	lb.	0	0	5¼	to	0	0	5½
Caustic, 70%	ton	31	0	0	to	32	0	0
Caustic, 76%	ton	32	10	0	to	33	0	0
Hydrosulphite, powder, 85%	lb.	0	4	6	to	0	4	10
Hyposulphite, commercial	ton	35	10	0	to	37	10	0
Nitrite, 96-98%	ton	85	0	0	to	86	0	0
Phosphate, crystal	ton	43	0	0	to	44	0	0
Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	1	2½	to	0	1	3½
Sulphide, crystals	ton	30	0	0	to	32	0	0
Sulphide, solid, 60-62%	ton	45	0	0	to	47	0	0
Sulphite, cryst	ton	15	10	0	to	16	10	0
Strontium carbonate	ton	85	0	0	to	90	0	0

	per	£	s.	d.		£	s.	d.
Strontium Nitrate	ton	90	0	0	to	95	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	19	0	0	to	19	10	0
Roll	ton	19	0	0	to	19	10	0
Tartar emetic	lb.	0	3	0	to	0	3	2
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb	0	2	0	to	0	2	1
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	61	0	0	to	62	0	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	21				23	10	0

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	5	0	to	0	5	3
Alphanaphthylamine	lb.	0	3	6	to	0	3	9
Aniline oil, drums extra	lb.	0	1	8	to	0	1	9
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.		—		to		—	
Benzaldehyde (free of chlorine)	lb.	0	5	9	to	0	6	0
Benzidine, base	lb.	0	13	6	to	0	14	0
Benzidine, sulphate	lb.	0	10	6	to	0	11	0
Benzoic acid	lb.	0	4	0	to	0	4	3
Benzoate of soda	lb.	0	4	3	to	0	4	6
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	14	0	to	0	14	6
Betanaphthol	lb.	0	4	0	to	0	4	3
Betanaphthylamine, technical	lb.	0	11	6	to	0	12	6
Croceine Acid, 100% basis	lb	0	5	0	to	0	6	3
Dichlorbenzol	lb.	0	0	6	to	0	0	7
Diethylaniline	lb.	0	7	9	to	0	8	6
Dinitrobenzol	lb.	0	1	4	to	0	1	5
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	2	9	to	0	3	0
Dimethylaniline	lb.	0	5	9	to	0	6	0
Diphenylamine	lb.	0	5	0	to	0	5	3
H-Acid	lb.	0	14	6	to	0	15	0
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	6	to	0	8	0
Naphthionic acid, crude	lb.	0	5	0	to	0	5	6
Naphthionate of Soda	lb.	0	6	0	to	0	6	3
Naphthylamin-di-sulphonic-acid	lb.	0	5	6	to	0	6	8
Nitronaphthaline	lb.	0	1	6	to	0	1	8
Nitrotoluol	lb.	0	1	3	to	0	1	4
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	6	to	0	2	9
Orthonitrotoluol	lb.	0	1	3	to	0	1	4
Para-amidophenol, base	lb.	0	12	6	to	0	13	0
Para-amidophenol, hydrochlor	lb	0	13	0	to	0	13	6
Paradichlorbenzol	lb.	0	0	6	to	0	0	8
Paranitraniline	lb.	0	8	0	to	0	8	3
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	6
Paratoluidine	lb.	0	8	6	to	0	9	6
Phthalic anhydride	lb.	0	4	9	to	0	5	0
R. Salt, 100% basis	lb.	0	4	0	to	0	4	2
Resorcin, technical	lb.	0	11	6	to	0	12	6
Resorcin, pure	lb.	0	17	6	to	0	18	0
Salol	lb.	0	5	3	to	0	5	9
Shaeffer acid, 100% basis	lb.	0	3	6	to	0	3	0
Sulphanilic acid, crude	lb.	0	1	8	to	0	1	9
Tolidine, base	lb.	0	10	6	to	0	11	6
Tolidine, mixture	lb.	0	3	0	to	0	3	6

Manchester Chemical Trade

Sir S. W. ROYSE & CO., LTD., in their monthly report, dated October 27, state: The trouble in the coal trade, resulting in the strike of the miners, has adversely affected business, which has been mostly for spot or early delivery. Whilst some few products have maintained their values, prices generally are lower. Sulphate of copper has been disappointing, as, although there has been a better inquiry for shipment, the amount of actual business done has been only moderate. The position in green copperas has been unchanged, although shipping orders have fallen off somewhat. Acetates of lime and acetic acid are easier, and lower prices are being accepted for good definite business in acetate of lead and nitrate of lead.

Acetate of soda has, however, been in better request and stocks have been reduced. Carbonate of potash has been in larger supply with only a moderate demand and price is easier. Caustic potash and Montreal potashes have also a lower tendency. Yellow prussiate of potash remains very dull, but prussiate of soda has been steadily called for and stocks are only small. White powdered arsenic continues in short supply and price is fully maintained. There has been some pressure to reduce stocks of tartaric acid by lower prices, but with little success, and the demand for forward delivery has fallen away. Lower prices have been accepted for citric acid. Cream of tartar has been in better request. American bichromates of potash and soda have been offered freely at reduced prices, and there are ample stocks. Oxalic acid is easier and the supply is in excess of the demand, whilst concessions in price are offered for forward shipment from the Continent. Borax and boracic acid are in good request. Phosphate of soda is unchanged, but there is some accumulation of stocks of the imported product. Muriate of ammonia has had a better demand for export account, but second-hand parcels of sal-ammoniac are freely offered. The demand for bleaching powder and caustic soda is less active, but soda ash is in fair inquiry. Chlorates of potash and soda are quiet.

The position of tar products has undergone very little change. Benzol, if anything, is easier. Toluol is rather dearer, supplies being readily taken up. Solvent naphtha is showing more strength, although inquiries are scarce, consumers buying from hand to mouth. Heavy naphtha is without change. Creosote is in good request and maintains its firm tone. Crude carbolic acid shows little activity and prices are somewhat lower. Little business is passing in crystal carbolic and the demand for cresylic acid has slackened. Pitch continues steady, although business has eased off owing to the present industrial trouble, the briquette makers in South Wales being closed down. The export demand for sulphate of ammonia has rather fallen off through competition from abroad, but the supplies for the home market are scarce.

Alsatian Potash

FRENCH kainit, 14 per cent., and French potash salts, 20 per cent., are the grades of potash most in demand at the present time. For the autumn manuring of grass land French kainit is now much recommended. The different grades of French potash salts have been on the market for over a year, with satisfactory results. The fine dry condition of the Alsatian salts is a great advantage for even distribution.

Company News

AGUAS BLANCAS NITRATE.—An interim dividend of 1s. 6d. per share has been declared by the Aguas Blancas Nitrate Co.

VAL DE TRAVERS.—An interim dividend of 2½ per cent. (3d. per share), less tax, becomes payable on Oct. 30. Last year's dividend was the same.

SLOMEN NITRATE.—According to a Valparaiso report a group of American financiers has made an offer for the purchase of the nitrate works owned by the Slomen Nitrate Works Company, a German concern.

Messrs. Alexander Frazer, 11, Teviot Place, Edinburgh, makers and dealers in chemicals, have formed a private limited company to carry on the existing business. The authorised capital is placed at £2,000.

ANGLO-CHILIAN NITRATE.—An interim dividend on account of 1920 of 10s. per ordinary share, free of tax, is declared, being 10 per cent., payable November 16. A year ago no interim was paid. The total dividend in 1919 was 15 per cent.

ANGLO-ECUADORIAN OILFIELDS.—Government quarantine regulations at Ecuadorian ports have prevented the company's Lima accountant from visiting the field until quite recently. Under these circumstances it is not yet possible to submit to shareholders the balance-sheet for last year and the directors' report thereon. The board have decided to convene without delay the company's first ordinary annual general meeting, and this will be held at Winchester House on October 29 at 12.30 p.m.

NATIONAL PAPER AND PULP CO.—An issue of £200,000 8 per cent. first mortgage redeemable debentures at 98 per cent. and 150,000 ordinary shares of £1 at par will be issued this week. The debentures will be repayable at 103 by the operation of a cumulative sinking fund of 3 per cent. commencing July 1 of next year. The trustees for the debenture-holders are the Corporation of the Royal Exchange Assurance. The directors and their friends are applying for 100,000 shares on the terms of the prospectus.

ALIANZA COMPANY.—For the year 1919 the company's net profits were £67,400, as compared with £364,000 for 1918, and the shareholders, who in 1917 and 1918 received dividends of 40 per cent., only received 10 per cent. on the last year's working. The interim dividend now announced is 30 per cent. The previous interim payment (made two years ago) was 20 per cent., though that was made free of income tax, whereas the current dividend will be paid less tax. This bears evidence of the recovery in the Chilean nitrate industry this year.

ERINOID, LTD.—At the fifth annual general meeting it was announced that steps were being taken to make an immediate issue of additional share capital, which would be offered at a premium of 5s. per share. The Chairman said the factory at Stroud had been developed to the utmost, but further building there was not possible at the moment. An up-to-date factory, well adapted for mass production, has been bought at Yate, near Bristol. The year had proved a record one, both as regards sales and profits. A dividend of 22½ per cent., less income tax at 6s., was declared.

KERN RIVER OIL.—Mr. W. Ivey, chairman, presided at the general meeting of Kern River Oilfields of California, Ltd., on Wednesday. He said the report was the best ever presented. Dividend was increased from 15 to 17½ per cent. and paid on a capital which had been enlarged to the extent of £100,000. It was proposed to increase the capital to £1,500,000. A dividend of 12½ per cent. was declared, making 17½ per cent. for the year, and it was resolved to adopt new Articles of Association, and to increase the capital by the creation of 1,805,615 additional srares of 10s. each.

PEACHEY PROCESS.—A meeting was held on Monday, October 25, at Winchester House, when the statutory report was presented. The report states that the total number of shares allotted is as follows: 8 per cent. cumulative participating preference shares of £1 each, 52,313; ordinary shares of £1 each, 102,448; deferred shares of 1s. each, 100,000, of which 27,000 8 per cent. cumulative participating preference shares, 43,000 ordinary shares, and 100,000 deferred shares are allotted as fully paid up in consideration for the transfer to the company of the patent rights in the United Kingdom and the benefit of applications for patents in foreign countries and the colonies under agreement dated August 3, 1920; and upon the remaining shares the following sums have been paid: 20s. per share on 400 preference and 407 ordinary; 10s. per share on 23,633 preference and 56,725 ordinary; 5s. per share on 1,280 preference and 2,316 ordinary. The total amount of cash received in respect of shares issued wholly for cash is £41,885. The preliminary expenses of the company are estimated at £11,500.

HARRISONS & CROSFIELD.—In the absence through ill health of Mr. Croll, Mr. C. H. Clark presided at the twelfth ordinary general meeting of Harrisons & Crosfield on October 21st. Satisfactory results were obtained on the year's working, total net earnings amounting to £249,203, as against £200,571 a year ago. Share capital has been increased by 19,000 6 per cent. cumulative preference shares, 400,000 preferred ordinary shares at a premium of 6s. 6d., and allotment of 20,610 deferred ordinary shares which have been paid for. A year ago the general-reserve fund was brought up to a total of £315,000. £111,078, the net amount of the premium on the last issue of preferred ordinary shares, has now been added to it, and it was proposed to add £13,922 out of the year's profits, thus bringing the reserve up to £440,000, equivalent to about 24 per cent. of the share capital. The mortgages on freehold property have been reduced by £23,000, and further reduction of a similar amount during the present month was anticipated. The amount of money deposited with the company shows an increase of £215,000, and the total due to sundry creditors about £140,000 more than a year ago; but, on the other hand, bank overdrafts have been reduced by over £100,000. The Chairman moved: "That the following dividends be declared and paid forthwith, namely, a final dividend on 177,646 deferred ordinary shares, amounting to £17,137 12s. 8d., and a final dividend on 500,000 management shares, amounting to the same amount." The resolution was passed unanimously.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Partnerships Dissolved

DEWEY, GILBERT, and KINCH, EDWIN JOHN WHARTON, scientific instrument makers, May Place, Herbert Road, Plumstead, London, under the style of Dewey, Kinch & Co., by mutual consent as and from October 23.

WEBSTER, REGINALD, BLOOMER JULIUS HINTON, and CROSSLAND, CHARLES, makers of refractory materials, &c., Marriott Wood Brick Works, Millhouses, Sheffield, under the style of Webster & Co., by mutual consent as and from April 15, 1920. All debts received and paid by R. Webster and J. H. Bloomer, who will carry on the business under the same style.

Notice of Dividends

DRIVER, JOHN GEORGE, 70-72, St. Mary's Road, Garston, Liverpool, chemist and druggist &c., 7½d. supplemental, November 2. Offices of the Official Receiver, Union Marine Buildings, 11, Dale Street, Liverpool.

SWITHENBANK, HAROLD, 132, Beeches Road, West Bromwich, analytical chemist. 1s. Third. November 1. Official Receiver's Offices, Ruskin Chambers, 191, Corporation Street, Birmingham.

Companies Winding Up Voluntarily

BASIC PHOSPHATE CO., LTD. Creditors' claims on or before November 30 to the liquidator, Mr. W. Tomlinson, The Green, Seaton Carew, S.O.

NITROGEN PRODUCTS & CARBIDE CO., LTD, (In voluntary liquidation for the purpose of amalgamation.) Creditors' claims on or before December 10, to the liquidator, Mr. H. A. McMahon, Winchester House, Old Broad Street, London, E.C.2.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

BRITISH GLASS BOTTLES, LTD., Derby.—Registered October 15, £400 mortgage, to Mrs. M. Leslie, Ittingstone Farm, Shirley (Derby), widow, and another; charged on six messuages in Station Street, Rawson Green, Kilburn (Derby), and land adjoining. *Nil. November 6, 1919.

PARK GREEN DYE WORKS, LTD., Macclesfield.—Registered October 15, letter of deposit with title deeds securing all moneys due or to become due, to London County Westminster and Parr's Bank, Ltd.; charged on messuage or dwelling house, dye works and premises in Park Green, Macclesfield. *Nil. May 18, 1920.

WELSH METALS EXTRACTION CO., LTD., Lanelly.—Registered October 14, debentures securing all moneys due or to become due, to Barclays Bank, Ltd.; general charge. *Nil. October 8, 1920.

Satisfactions.

LONDON CHEMICAL WORKS, LTD., Southall.—Satisfaction registered October 18, £600, registered June 29, 1918.

MERSEY OIL & CAKE MILLS CO., LTD., Liverpool.—Satisfaction registered October 12, all moneys due, &c., registered March 24 1919.

SPHINX PETROLEUM CO., LTD., London, E.C.—Satisfaction registered October 12, £5,454. 10/10, registered August 7, 1919.

Bills of Sale

[*The undermentioned information is from the Officia Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.*]

GADDES, WILLIAM BARNFATHER, 3, Bradford Buildings, Warlingham, pharmaceutical chemist. Filed October 25, £1,000.

JOWETT, FRANK THORNTON, Final Royd, Emmitthill, Birkenshaw, chemical manufacturer and dyer and bleacher. Filed October 22. £150.

SMYTHE, J. SEABURY, Ingle Nook, Ingleton, analytical chemist. Filed October 20. £1,000.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

LONGMAF, J. H., Dorchester Road, Weymouth, late chemist, now manager. £14 11s. 9d. September 18.

LUNN, H. NELSON, 402, Victoria Street, Grimsby, chemist. £13 9s. 2d. September 21.

DAVIES, O. T., 5, The Broadway St. Margarets-on-Thames chemist. £10 3s. 8d. September 22.

BARHAM, J., 72, Emmanuel Road, Balham, chemist. £348s. 7d. September 15.

New Companies Registered

The following have been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.:—

ASBESTOS & MINERAL CORPORATION, LTD., Tower House, 40, Trinity Square, E.C.—Manufacture asbestos and other heat-resisting minerals, &c. Nominal capital £2,500 in 2,5000 shares of £1 each. Directors: B. Marcuse, W. B. Leventritt, L. Vandewelde. Qualification of directors £50. Remuneration of directors £200 each.

A. V. A. COMPANY, LTD.—Manufacturers of acetylene gas generators. Nominal capital £2,000 in 2,000 ordinary shares of £1 each. Directors to be appointed by subscribers. Qualification of directors, £100. Subscribers: C. J. Brimble and E. W. K. Baldwin.

SPENCE & CO. (NEWCASTLE), LTD., 46, Side, Newcastle-upon-Tyne. Manufacturers and dealers in soaps, chemicals, oils, paints. Nominal capital £5,000 in 5,000 shares of £1 each. Directors: D. D. Spence (man. dir.), E. H. Greene (man. dir.), T. F. Burgess. Qualification of directors, £100. £100 each managing directors.

SYNLAC, LTD.—Manufacturers and dealers in varnishes and paints. Nominal capital £3,200 in 3,200 shares of £1 each. Directors: To be appointed by subscribers. Qualification of directors, £50. Remuneration of directors, £25 each. Subscribers: G. T. E. Cockerill and H. S. Bridel.

FOURNIER PROCESS (FUELS), LTD.—To acquire any invention for treating fuel and carry on the business of mechanical engineers. Nominal capital £30,000 in 10,000 preference and 20,000 ordinary shares of £1 each. Directors to be appointed by subscribers. Remuneration of directors £250 each. Chairman £300. Subscribers: C. L. Humphrey, E. C. Scott.

MELDONITE GLASS, LTD.—Manufacturers of glass and porcelain. Nominal capital £250,000 in 250,000 shares of £1 each. Minimum subscription, seven shares. Directors: G. K. Peto, C. F. Smith and G. E. Woodman. Qualification of directors £1,000. First directors one share. Remuneration of directors £400 each. Chairman £500.

MIDDLETON SUNDRIES MANUFACTURING CO., LTD., Sterling Works, Cheapside, Wakefield.—Drysalters and druggists. Nominal capital, £6,000 in 2,000 preference shares and 4,000 ordinary shares of £1. Directors: W. Waters. Qualification of directors, 200 ordinary shares.

PAULDING (T.) & CO., LTD., 27, Brazennose Street, Manchester. Chemical and metal merchants. Nominal capital, £20,000 in 20,000 shares of £1 each. Directors: T. Horrocks, J. M. Horrocks, A. Horrocks, F. Horrocks, and A. Heywood. Qualification of directors, £250.

SUPEX, LTD., 22, Cork Street, W. 1. Manufacturing chemists, &c. Nominal capital, £100 in 100 shares of £1 each. Directors: G. Dobson and D. A. Ruffman. Qualification of directors, one share.

TRURO PATENT FIRE RESISTER SYNDICATE, LTD. Manufacturers of chemicals and chemical compositions. Nominal capital, £400 in 400 shares of £1 each. Directors to be appointed by subscribers. Qualification of directors, 10 shares. Remuneration of directors, 20 per cent. of net profits. Subscriber: L. S. Woolf.

Chemical Merchant's Insolvency

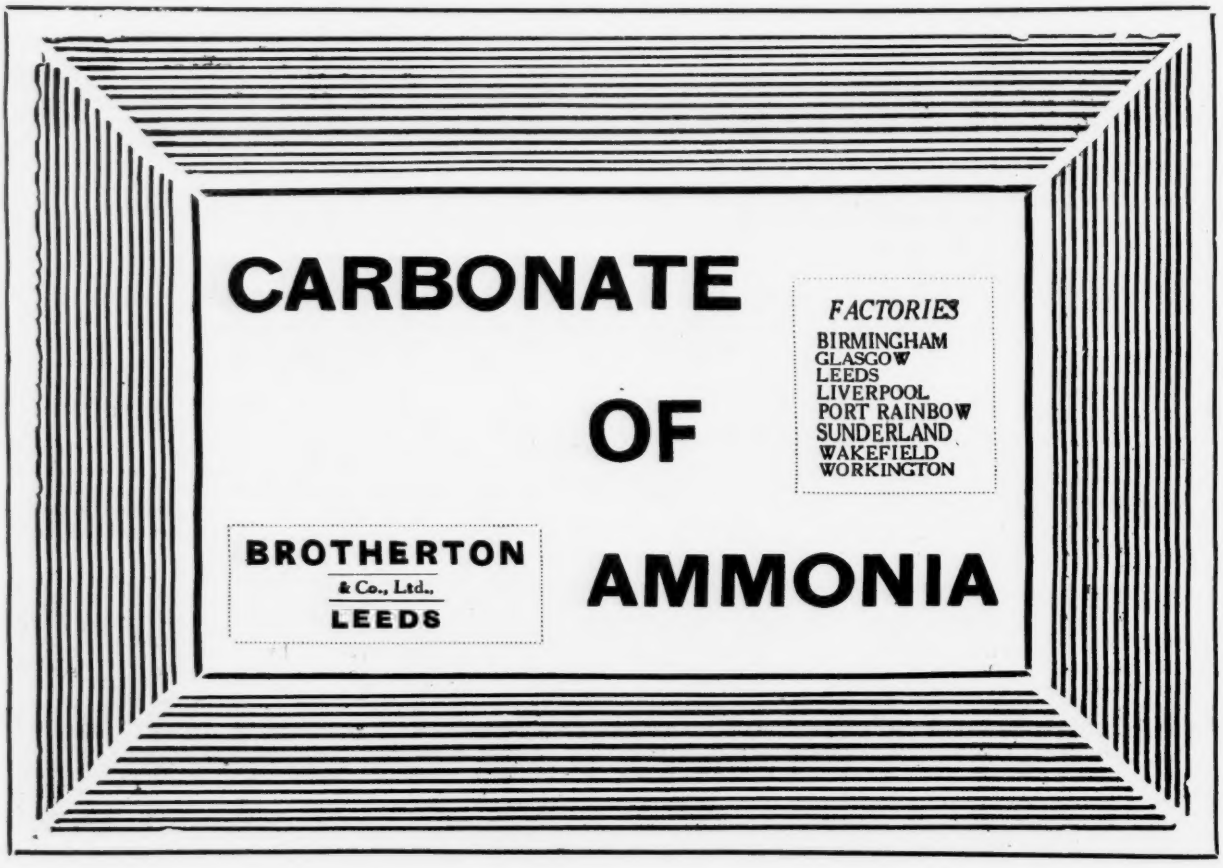
THE first meeting of creditors of Samuel Diamant, chemical merchant, 51, Castellain Mansions, Elgin Avenue, W., under a receiving order made against this debtor on October 12 was held on Tuesday at the London Bankruptcy Court. The proceedings were instituted on the petition of J. D. Pritchard & Co. (Ltd.).

Mr. E. Parke, Official Receiver, reported that the debtor had attended for preliminary examination, and had stated that he was a Russian, and had not been naturalized in this country. On his arrival in London he had £500, and he began business as an importer and exporter of chemicals. He was successful until the end of 1916 when, owing to restrictions and the state of his health he closed it. Early in 1919, he started work again and had since dealt in potash. Latterly, he said, there had been no market for potash, and he had sold at a loss. The immediate cause of his insolvency was a judgment recovered against him by the petitioning creditors.

The debtor estimated his liabilities at £500, and disclosed as assets doubtful book debts £60. He said that if given an opportunity he hoped to pay his debts in full.

The meeting was adjourned till November 9 with a view to the appointment of a trustee.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

Locality of Firm or Agent.	Materials.	Ref. No.
Brussels ...	White lead ground in oil; powdered antimony.	578
Hong-Kong ...	Chemicals; soap	574
Riga	Oil; grease...	586
Turkey ...	Paints; varnishes. Applications to the Department of Overseas Trade (Development and Intelligence), 35, Old Queen St., London, S.W. 1.	—
Melbourne ...	Cream of tartar	524
Sydney ...	Glassware	526
Port Elizabeth	Paints	533
Mesopotamia	Oil engines; centrifugal pumps ...	547